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# **The State Scale of Dissociation:**

**Development, psychometric validation,  
and application in a study of concurrent  
electro-encephalographic correlates**

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**submitted for the Degree of Doctor of Medicine (MD)  
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## *Summary*

The distinction between state and trait dissociation informed the development and psychometric validation of the State Scale of Dissociation (SSD) and the study of concurrent electro-encephalographic (EEG) correlates of experimentally induced dissociative states.

Existing scales measure trait dissociation. The need for a state scale was addressed by the development and testing of a present-state, self-report measure. Fifty-eight preliminary items were sorted into 7 subscales: derealisation, depersonalisation, identity confusion, identity alteration, conversion, amnesia, and hypermnesia. A revised 56-item SSD was administered with other psychiatric scales (DES, BDI, BAI, SCI-PANSS) to patients with DSM-IV major depressive disorder (n=19), schizophrenia (n=18), alcohol withdrawal (n=20), dissociative disorders (n=10), and controls (n=63). The SSD was demonstrated to be a valid and reliable measure of severity, and changes in severity, of dissociation at the time of its completion. Discriminant validity, content, concurrent, predictive, internal criterion-related, internal construct, and convergent validities were confirmed statistically by factor analysis, Spearman's rho correlations, confidence intervals, predictive analysis, and parametric and non-parametric comparisons of dependent and independent samples. It showed high internal consistency (Cronbach's alpha = 0.97) and high split-half reliability (Guttman coefficient = 0.92). The conversion subscale clustered with the other subscales into one general factor on factor analysis and did not support its segregation from dissociative disorders in DSM-IV.

State characteristics of dissociation were also examined in 11 patients with complex partial epilepsy. The relationship between concurrent EEG and experimentally induced dissociative states was examined by repeated SSD and baseline DES measurements after spectral analysis of EEG. Canonical analysis demonstrated significant SSD-EEG correlations. Amnesia, identity alteration, and identity confusion correlated with theta, frontal delta, and fast wave EEG activity respectively.

The SSD now allows for further investigation of the suggested state continuum of severity and trait continuum of frequency of dissociation in more comprehensive studies of concurrent neurobiological correlates.



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## *List of abbreviations*

<b>^2</b>	squared, e.g., micro-Volts <sup>2</sup> = micro-Volts squared
<b>α</b>	alpha (electro-encephalographic activity in the alpha frequency range); also refers to Cronbach's alpha
<b>@</b>	at
<b>amn</b>	amnesia subscale of the SSD
<b>β</b>	beta (electro-encephalographic activity in the beta frequency range)
<b>BAI</b>	Beck Anxiety Inventory
<b>BDI</b>	Beck Depression Inventory
<b>BFI</b>	Bear-Fedio Inventory
<b>BPD</b>	borderline personality disorder
<b>CDAP</b>	Checklist of dissociative and anxiety phenomena
<b>con</b>	conversion subscale of the SSD
<b>CPE</b>	complex partial epilepsy
<b>CT</b>	computerised tomography
<b>δ</b>	delta (electro-encephalographic activity in the delta frequency range)
<b>dep</b>	depersonalisation subscale of the SSD
<b>der</b>	derealisation subscale of the SSD
<b>DES</b>	Dissociative Experiences Scale
<b>DDIS</b>	Dissociative Disorders Interview Schedule
<b>DID</b>	dissociative identity disorder
<b>DIS-Q</b>	Dissociation Questionnaire
<b>DPI</b>	Depersonalisation Inventory
<b>DSM-IV</b>	Diagnostic and Statistical Manual of Mental Disorders, 4th edition
<b>EEG</b>	electro-encephalogram / electro-encephalographic
<b>FFT</b>	Fast Fourier Transform
<b>HSCL</b>	Hopkins Symptom Checklist
<b>HSCL-D</b>	Dissociation Scale for Symptom Checklist and Hopkins Symptom Checklist
<b>HV</b>	hyperventilation

<b>hyp</b>	hypermnesia subscale of the SSD
<b>Hz</b>	Hertz (frequency)
<b>ICD-10</b>	International Classification of Diseases, 10th edition
<b>ida</b>	identity alteration subscale of the SSD
<b>idc</b>	identity confusion subscale of the SSD
<b>KKDMP</b>	Kelley-Kodman Self-report Questionnaire of Dissociation and Multiple Personality
<b>μV<sup>2</sup></b>	micro-Volts squared
<b>mir</b>	mirror staring
<b>MMPI</b>	Minnesota Multiphasic Personality Inventory
<b>MPD</b>	multiple personality disorder
<b>MRI</b>	magnetic resonance imaging
<b>NCDI</b>	North Carolina Dissociation Index
<b>NPV</b>	negative predictive value
<b>OMSE</b>	Office Mental State Examination
<b>PANSS</b>	Positive and Negative Syndrome Scale
<b>PAS</b>	Perceptual Alteration Scale
<b>PDEQ</b>	Peritraumatic Dissociation Experiences Questionnaire
<b>PDS</b>	Phillips Dissociation Scale
<b>PPI</b>	Personal Philosophy Inventory
<b>PPV</b>	positive predictive value
<b>PSE</b>	Present State Examination
<b>PTSD</b>	post-traumatic stress disorder
<b>QED</b>	Questionnaire of Experiences of Dissociation
<b>SANS</b>	Scale for the assessment of negative symptoms
<b>SAPS</b>	Scale for the assessment of positive symptoms
<b>SASRQ</b>	Stanford Acute Stress Reaction Questionnaire
<b>SCI-CPSLS</b>	Structured Clinical Interview for Complex Partial Seizure-Like Symptoms
<b>SCID-D</b>	Structured Clinical Interview for DSM-IV Dissociative Disorders
<b>SCI-PANSS</b>	Structured Clinical Interview for the Positive and Negative Syndrome Scale

<b>SCL-90</b>	Symptom Checklist - 90
<b>SCL-90-R</b>	Symptom Checklist - 90 - Revised
<b>SD</b>	somatisation disorder / standard deviation
<b>SDQ-20</b>	Somatoform Dissociation Questionnaire
<b>SE</b>	standard error
<b>SPSS</b>	Statistical Package for the Social Sciences
<b>SSD</b>	State Scale of Dissociation
<b>θ</b>	theta (electro-encephalographic activity in the theta frequency range)
<b>TLE</b>	temporal lobe epilepsy
<b>TSC-40</b>	Trauma Symptom Checklist - 40
<b>TSI</b>	Trauma Symptom Inventory



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## ***Part I - Introduction***

### **1**

## **State and trait characteristics of dissociation**

Psychiatry and psychology view ‘dissociation’ in two ways, as a state phenomenon and as a trait phenomenon. Historically, however, predominance has been given to ‘dissociation’ as a trait phenomenon despite evidence for its state characteristics. This chapter, then, serves to highlight both the state and the trait characteristics of dissociation. Evidence for the historical predominance of the trait characteristics of dissociation is found in the nature of all the psychometric scales to date. These existing scales will be considered in the next chapter. This chapter concludes with three suggested ways in which the state characteristics of dissociation could be examined further. The suggested ways to examine state characteristics serve as the basis of part II and part III of this thesis.

Since the duration of dissociative experiences is central to the distinction between trait and state characteristics, aspects of the duration of dissociative experiences will be examined systematically by looking at the dissociative disorders and their nosology, dissociative symptoms, and dissociative mental phenomena. As part of this examination, the literature is reviewed for neurophysiological correlates of dissociative experiences, to inform us on the durational aspects of dissociation as well. The presentation of the more apparent state and trait aspects of dissociation in such a systematised way serves the additional purpose of introducing ‘dissociation’ as particular disorders, as particular symptoms, and as particular mental phenomena.



From this examination, a need will be evident for scientifically accountable ways to study the state characteristics of dissociation. In order to address this need, three ways are suggested, drawing on standard psychiatric research practice: first, the assessment of existing measures of dissociation for state and trait characteristics; second, the development and psychometric testing of a measure of dissociative states, and the use of such a state-measuring instrument in clinical samples; and third, a study of neurophysiological states concurrent to the dissociative states. The third way will be dependent on the second, since dissociative states need to be measured for the study of correlations with neurophysiological states. However, the instrument to measure dissociative states has to be developed first, as will be demonstrated in Chapters 4 - 7.

The distinction between traits and states is not new in psychiatry. Moreover, it is necessary to be informed on state and trait characteristics of patients' psychiatric difficulties. In fact, this distinction underlies the discrimination between various psychiatric disorders. For example, a major depressive episode is typically a state disorder whereas dysthymia is a trait disorder. This does not mean, though, that a particular psychiatric disorder or symptom is necessarily either the one or the other. Rather, states and traits are in some instances dual aspects of a particular psychiatric disorder or symptom. Regarding psychiatric disorders in general, Kraemer et al. (1994) and Reich (1989) consider the methodological value of examining both state and trait aspects of psychiatric disorders. Trait and state aspects of disorders have been studied for various psychiatric disorders. To make the precedent clear, trait markers have been identified for depression (Brittlebank et al., 1993; Suzuki et al., 1996; Baron et al., 1986; Kusumi et al., 1994), and late luteal phase dysphoric disorder (Yatham, 1993); the study of Halbreich et al. (1996) suggests that a

decreased gamma-aminobutyric acid (GABA) concentration is a trait of major depressive disorder, whereas for premenstrual dysphoric disorder there is a state-dependent decreased GABA concentration; Riemann et al. (1994) examined sleep as a state-dependent marker or trait-dependent marker of depression; Schrader's study (1994) concluded that chronic depression was a trait-like disorder; trait-dependent markers for bipolar disorder were found to be low plasma GABA (Petty et al., 1993) and serum melatonin (Kennedy et al., 1996); Joseph-Vanderpool et al. (1993) found different state and trait markers for seasonal affective disorder; Thase et al. (1994) found distinctive state and trait features of depression on polysomnography. Besides the mood disorders, Goodman & Price (1992) examined the state and trait aspects of scales for obsessive compulsive disorder; Dettling et al. (1995) compared growth hormone concentrations to the state and trait aspects of alcoholism; the work by Oei et al. (1990) and Papay & Spielberger (1986) found support for state and trait features of anxiety; and Juckel et al. (1996) demonstrated a trait dependence of P300 amplitude in schizophrenia.

Also at the symptom level of enquiry, states and traits have been useful heuristically. Abbar et al. (1996) and Soloff et al. (1994) studied the state and trait aspects of suicidal behaviour; Woodruff et al. (1997) studied correlations between different cortical areas and the state and trait aspects of auditory hallucinations; Horton et al. (1992) called for a trait measure for alexithymia alongside the existing alexithymic state measures. Carey & DiLalla (1994) conclude that genetic factors are linked not only with personality traits, but also with state symptoms of anxiety and depression; Peselow et al. (1994) and Loranger et al. (1991) studied the effects that depressive states may have on the assessment of personality traits.

Research on dissociation, though, has devoted very little attention to the distinction between states and traits, and most authors only imply them. Crown (1975), however, remarks in his letter that the distinction between trait and state phenomena might be pivotal in the study of the aetiology of dissociation (that was addressed as 'hysteria'). More specifically, Brenner's (1996) review article offers a model to explain the dual quality of dissociation: Dissociative identity disorder would be considered a lower-level dissociative character, where splitting is enhanced by autohypnotic defensive altered states of consciousness. Closely related to the distinction between state and trait, Waller et al. (1996) argued that non-pathological dissociative experiences are manifestations of a dissociative trait, whereas pathological dissociative experiences are manifestations of a latent class variable. Butler et al. (1996) applied the stress-diathesis model to dissociative symptomatology. They regarded high hypnotisability as the diathesis (which is trait-like) for pathological dissociative states, particularly under conditions of acute stress.

Consequently, looking at the state and trait aspects of dissociation in more detail in the systematised way suggested above, these aspects will be considered at the 'disorder' level. At this level it will be clear that most of the dissociative disorders present as transient 'states', notwithstanding the trait-like aspects of some dissociative disorders. This observation contrasts with the surprising predominance given to the trait-dependent features of dissociation in psychometric measures.

### ***1.1 Dissociative disorders***

The tenth edition of the International Classification of Diseases (ICD-10) (WHO, 1992) describes the common theme of the dissociative disorders as a partial or complete loss of the ability to exercise a conscious and selective control over the

normal integration of memories of the past, awareness of identity and immediate sensations and control of bodily movements. The ICD-10 describes aspects of duration as often being of sudden onset and termination, but the disorder may endure over years. The fourth edition of the Diagnostic and Statistical Manual of Mental Disorders (DSM-IV) (APA, 1994) describes the essential feature of dissociative disorders as a disruption in the usually integrated functions of consciousness, memory, identity, or perception of the environment. This states that the disturbance may be sudden and transient (when it is like a ‘state’) or gradual and enduring (when it is like a ‘trait’).

However, despite the convergence of these definitions for dissociative disorders, the scope of dissociative disorders is not the same for the ICD-10 and DSM-IV owing to the historic development of the nosology. A distinction between conversion and dissociation varieties of hysteria informed the official classifications of the World Health Organisation, and the Diagnostic and Statistical Manuals of the American Psychiatric Association from the 1930s to the 1970s (Nemiah, 1975a,b). Up to DSM-II (APA, 1968), conversion hysteria, which subsumed sensorimotor symptoms, was distinct from dissociative hysteria, in which alterations in the state of consciousness or identity manifested as amnesia, somnambulism, fugue, and multiple personalities. DSM-III (APA, 1980) dropped references to hysteria, and introduced a set of dissociative disorders and a set of somatoform disorders. Although the most recent classifications of the APA (1994) and the WHO (1992) both recognise a set of dissociative disorders, they differ significantly (Table 1.1<sup>1</sup>).

The ICD-10’s scope of dissociative disorders includes the conversion disorders of DSM-IV. The DSM-IV category of dissociative identity disorder (DID),



previously called multiple personality disorder (MPD), is not a major subtype in ICD-10, and depersonalisation disorder is not classified as a dissociative disorder in ICD-10. Conversely, the ICD-10 categories of trance and possession disorders and dissociative stupor have to be accommodated in the “not otherwise specified” section of DSM-IV. While ICD-10 permits a diagnosis of “organic dissociative disorder”, DSM-IV does not distinguish dissociative disorders due to the direct physiological effects of a substance, or to a neurological or other general medical condition, other than using these as examples for a cognitive disorder not otherwise specified.

In order to overcome the differences between the dissociative disorders of ICD-10 and DSM-IV for the purpose of looking more closely at aspects of duration of dissociative disorders, an inclusive approach (as background) in the consideration of the following dissociative disorders is followed with the origin(s) of the disorder indicated in brackets.

### *1.1.1 Dissociative amnesia (ICD-10 & DSM-IV)*

Dissociative amnesia is predominantly characterised by the inability to recall important personal information, usually of a traumatic or stressful nature, which is too extensive to be explained by ordinary forgetfulness or fatigue. It may develop suddenly and terminate abruptly, and it is often transient. Then it presents more like a state. However, a patient may have an enduring inability to recall personal information, and then the memory loss is often more selective and partial. Thus, it is then more like a trait. Mace & Trimble (1991) list psychogenic amnesias in approximate order of chronicity, from situational amnesia, through Ganser syndrome, psychogenic fugue and others, to multiple personality disorder and histrionic personality disorder.

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<sup>1</sup> Tables and figures are presented at the end of the relevant chapter.

Needless to say, amnesia states may for some patients be superimposed on or predisposed by amnesia traits. Neurophysiological correlates of dissociative amnesia will be discussed at the symptom level in the next section.

### *1.1.2 Dissociative fugue (ICD-10 & DSM-IV)*

A dissociative fugue is predominantly characterised by a sudden and unexpected journey away from home or workplace, with an inability to recall one's past, and with confusion about one's personal identity or the assumption of a new identity. This disorder is typically a manifestation of a dissociative state, since it is usually of sudden onset and brief (hours to days) with a rapid recovery. Owing to this particular and necessary behaviour, which is a travelling 'flight' (fugue means flight etymologically), the disorder is much more like a state since the disorder holds only as long as the patient is on the (or in) 'flight'. Neurophysiological correlates of dissociative fugue will be discussed at the symptom level in the next section.

### *1.1.3 Dissociative disorders of movement and sensation (ICD-10) or conversion disorder (DSM-IV)*

In these disorders, there are symptoms or deficits affecting voluntary motor and sensory function that suggest a neurological or other (non-psychiatric) medical condition, and psychological factors are associated with the symptom or deficit. For the majority of patients with these disorders, the disorder starts suddenly and disappears in a few days or less than a month. This kind of conversion disorder is thus very much state-like. Historically, however, major and minor varieties of hysteria have been distinguished that resemble epilepsy and chronic paralyses respectively (Mace, 1992a,b).

Regarding neurophysiological correlates to these disorders, it is commonly noted that electro-encephalographic features are absent, especially when epilepsy is contrasted with the pseudoseizures of a conversion disorder (Boon & Williamson, 1993). Preliminary studies reported hypometabolism of the dominant hemisphere and hypermetabolism of the non-dominant hemisphere amongst patients with a conversion disorder (Kaplan et al., 1994). These results are neurophysiological correlates at the time of the disorder, and therefore represent state-dependent findings.

#### *1.1.4 Organic dissociative disorder (ICD-10)*

Dissociative symptoms occur *inter alia* in epilepsy (Lishman, 1987), head injury and cognitive disorders (Nemiah, 1975b, 1989), substance abuse and intoxication (Dunn et al., 1993; Saxe et al., 1993). Epilepsy is a condition with state and trait characteristics. Episodic states (for example, seizures) are superimposed on trait-like tendencies. Associated with the episodic states, dissociative symptoms are known to present pre-ictally, ictally and postictally. These dissociative symptoms present as (mostly transient) states, which include amnesia, fugues, depersonalisation, dreamy or trance states, personal identity confusion and alteration, and experiences such as *déjà vu* and *jamais vu*. The trait-dependent aspects of epilepsy are present interictally, and include *inter alia* various electro-encephalographic features, hypergraphia, illusions, speech problems, “hypermoralism”, hyper-religiosity, emotional viscosity, hyposexuality, humourlessness and sobriety, dependence, passivity, obsessionality, circumstantiality and philosophical preoccupations (Bear & Fedio, 1977; Roberts et al., 1990; Makarec & Persinger, 1990). However, there are also interictal dissociative symptoms that may present as trait-like features of an organic dissociative disorder. In addition to other case reports, for example, Mesulam (1981) reported 12 patients with

epilepsy concurring with a clinical picture reminiscent of multiple personality disorder. It is clear that dissociative experiences are well-known in the presentation of epilepsy, and they present at least as state-like phenomena but there is also some evidence for trait-like dissociative symptoms in epilepsy. Neurophysiological correlates to an epileptic dissociative disorder will be discussed at symptom level.

#### *1.1.5 Depersonalisation disorder (DSM-IV)*

This disorder is characterised by the persistent or recurrent experiences of feeling detached from, and as if one is an outside observer of one's mental processes or body. If it is persistent, it may be considered as trait-like. Much more often, though, it is a disorder manifesting as recurrent transient states of detachment.

Its state-like character is also supported by the observation that depersonalisation states could be induced by electrical stimulation of the cortex of the temporal lobes during neurosurgery (Kaplan et al., 1994).

#### *1.1.6 Dissociative identity disorder (DSM-IV) or multiple personality disorder (ICD-10)*

The essential characteristic of dissociative identity disorder (DID) is the presence of two or more distinct identities or personalities, each with its own relatively enduring pattern of perceiving, relating to, and thinking about the environment and self. Clearly, this description by DSM-IV depicts a trait-like picture of the disorder. Nonetheless its symptoms, such as identity alteration and identity confusion, are also state-like but these will be considered at the symptom level. Brenner (1996) examined DID in terms of state and trait qualities in particular. He argues for both qualities, and



states that if DID is understood in this way, this understanding has potential psychotherapeutic applications as well.

Although epilepsy has been hypothesised to be involved in the cause of DID, support for this is lacking since many patients with DID do not show clinical evidence of epilepsy (Loewenstein & Putnam, 1988). Nonetheless, between a fifth and a third of patients with epilepsy have a dissociative disorder, and half of them have DID (Devinsky et al., 1989; Mesulam, 1981; Schenck & Bear, 1981). Moreover, those who consider DID relevant to dissociation, despite the reservations (Merskey, 1992, 1995) about the credibility of this disorder, would point out the adoption of more than one identity by some epileptic patients, reports of which date back more than a century (Trowbridge, 1891; Sutcliffe & Jones, 1962; Rollin, 1996 - referring to Wilson's case description in 1896). Schenk & Bear (1981) found interictal dissociative phenomena, including alternate identities, in 13 of 40 patients with temporal lobe epilepsy. Coons et al. (1988) found some form of epilepsy in 5 of 50 patients with multiple personality disorder (MPD), and among those, EEG abnormalities in 7 of 30 patients with DID, varying from parasagittal spikes to frontal slowing (although their conclusion was to dispute a link between MPD and limbic or temporal lobe epilepsy).

Not only is the relationship between DID and EEG changes unclear and controversial, but it is also unclear which phase of epilepsy might be associated with alteration of identity. Schenk & Bear (1981) focused on interictal phenomena, suggesting that temporal lobe epilepsy, when involving limbic, emotion-mediating structures, produced altered affective associations interictally, thus predisposing to the use of dissociative defences. Schulz et al. (1995) observe that (postictal) amnesia of auras may be related to spread of the epileptiform discharge to involve and disrupt the function of both mesial temporal regions. Spiegel (1991b), however, raises the

possibility that focal temporal lobe non-seizure activity may be important in the generation of dissociative symptoms in the absence of seizures.

The studies of neurophysiological correlates to DID almost always fail to discriminate between the state and the trait features of DID. Mostly, though, the neurophysiological findings correlate with DID traits.

### *1.1.7 Dissociative trance disorder (DSM-IV) or trance and possession disorders (ICD-10)*

In these disorders, there is a temporary loss of both the sense of personal identity and full awareness of the surroundings. In some instances, the individual behaves as if taken over by another personality, spirit, deity, or ‘force’. Again, this trance is state-like rather than trait-like, since it is usually a transient disorder that may recur episodically. As far as the author could establish, neurophysiological correlates to this disorder are not yet known.

### *1.1.8 Summary*

At the disorder level, it is clear that most dissociative disorders present as transient ‘states’. They include dissociative amnesia, dissociative fugue, conversion disorder (or dissociative disorders of movement and sensation), organic dissociative disorder, depersonalisation disorder, and dissociative trance disorder. More rarely, these disorders may present in a persistent way but with, perhaps, a varying degree of severity, and for these instances a case could be made for them to be trait-like. In contrast, the remaining disorder, dissociative identity disorder, is usually enduring and may therefore be a trait-like condition, notwithstanding its state-like symptoms (Brenner, 1996) that occur over and above the DID ‘trait’.

## ***1.2 Dissociative symptoms***

For many psychiatric disorders, core symptoms are often debated, and the same applies to dissociation. The key dissociative symptoms might be considered those that have given rise to diagnostic groupings recognised in DSM-IV (APA, 1994) and ICD-10 (WHO, 1992), viz. amnesia, fugue, depersonalisation-derealisation, identity alteration, stupor, trance states, pseudoseizures, various paralyses, and anaesthesias. These symptoms are also the most frequently represented in scales of dissociation. However, there is no clarity yet as to which symptoms, if any, should be seen as the most typical. Steinberg (1993) distinguishes five core dissociative symptoms: amnesia, depersonalisation, derealisation, identity confusion, and identity alteration, thereby excluding conversion symptoms. The latter exclusion suggests potentially incomplete coverage of the scope of dissociation on the one hand. On the other hand, the SCID-D might potentially be over-inclusive with the inclusion of depersonalisation (Merskey, 1995). For purposes here, the more common dissociative symptoms, viz. amnesia, hypermnesia, identity confusion, fugues, alteration of personal identity, depersonalisation and derealisation are considered for aspects of duration and neurophysiological correlates.

### ***1.2.1 Amnesia and hypermnesia***

The predominant symptom of dissociative amnesia is an inability to recall important personal information, usually of a traumatic or stressful nature, which is too extensive to be explained by ordinary forgetfulness or fatigue. The symptom of dissociative amnesia is subject to debate whether it is an anterograde or a retrograde kind of amnesia. Problems with memory encoding (that is, anterograde amnesia) are distinguished conventionally from problems with memory retrieval (that is, retrograde

amnesia), since the former are considered as suggestive of an organic amnesia and the latter are considered part of the pathogenesis of psychogenic (functional) amnesia (Kopelman, 1995). However, Kihlstrom & Schacter (1995) draw attention to the archaic and artificial nature of the traditional distinction between functional and organic amnesias. Moreover, this distinction stands in contrast with Janet's (1914) description of an anterograde type of dissociative amnesia with failure to incorporate new memories into the personality, in addition to the more usually accepted retrograde amnesia, where there is dissolution of the existing personality and its memories.

Studies on the aetiology of dissociative amnesia resulting from severe trauma or severely stressful events seem to support dissociative amnesia as an anterograde amnesia. In these studies, impairments in the acquisition of new memories have figured strongly in the accounts of the pathogenesis of dissociative symptoms (West, 1967). Neurobiological explanations of how apparently psychogenic amnesias occur have gained ground (Kopelman, 1987), especially in relation to post-traumatic stress disorder / PTSD (Kolb, 1987; Hartman & Burgess, 1993; Van Der Kolk, 1994). The findings of such studies appear consistent with stress-related, neuromodulator-mediated deficits in encoding of explicit memory tasks, deficits in retrieval, and enhanced encoding or retrieval of specific trauma-related material (Bremner et al., 1996). Furthermore, Hartman & Burgess (1993) suggest that numbing or dissociation results when the limbic system is overwhelmed by incoming information. An important role for the amygdala has been inferred from its role in associating emotional meaning to memories through projections to the hypothalamus, hippocampus, and basal forebrain (Van Der Kolk, 1994). Similarly, failure to link spatiotemporal contexts with memory during dissociative amnesias has been attributed



to the septohippocampal system (Spiegel & Cardena, 1991; Allen, 1993). Dissociative amnesia thereby results from the storage of traumatic memories on a somatosensory or iconic level (as somatic sensations, behavioural enactments, nightmares, and flashbacks), rather than a linguistic level (Van Der Kolk & Van Der Hart, 1989; Allen, 1993; Van Der Kolk, 1994).

Van Der Kolk (1994) studied people with partial amnesias after traumatic events and animals following prolonged exposure to severe uncontrollable stress, to elucidate neurochemical correlates of post-traumatic memory impairment. It appears that high norepinephrine activity, as well as endorphins and oxytocin, interfere with RNA-dependent memory consolidation. Decreased serotonin activity and a rise in endogenous opioids observed in traumatised animals may explain how their subsequent behaviour appears responsive to internal as well as external stimuli.

Trauma has additional physiological effects likely to affect patterns of memory consolidation, notably by altered electrocortical synchronisation and selective enhancement of gene expression (Baraban, 1993; Marocco et al., 1994; Niedermeyer, 1994). Limbic theta activity has also been thought to enhance long-term potentiation (LTP) of memory (Lopes Da Silva, 1992), which in turn has been considered responsible for some of the overconsolidated memories such as flashbacks in dissociative dysmnesias (Marocco et al., 1994). These models currently suffer from the overlap between dissociative amnesias and other features of PTSD, but illustrate how the pattern of selective impairment of certain memories in dissociative amnesias may reflect physiological constraints at the time of the traumatic events.

From these trauma-related aetiological studies it seems that dissociative amnesia originally results from anterograde amnesia, and this concurs with Janet's aetiological account of dissociative amnesia. However, the aetiology of dissociative



amnesia should be distinguished from the clinical picture at the time of presentation with dissociative amnesia, since the patient does not usually have anterograde amnesia for new information at that time, but amnesia about the past (traumatic) events that could not penetrate consciousness at the time of their occurrence. In other words, memory encoding (anterograde amnesia) is hampered around the time of the (traumatic) event, whereas memory retrieval (retrograde amnesia) for the (traumatic) event is impaired at the later clinical presentation.

Problems with memory encoding and retrieval may be linked to the state and the trait characteristics of dissociation. This link may be proposed as follows: The traumatic event(s) may induce a dissociative amnesic *state* that prevents memory encoding (anterograde amnesia) around the time of the event. Thereafter, a dissociative amnesic *trait* may remain for the traumatic and related events with difficulty in memory retrieval (which seems like retrograde amnesia). A dissociative state may recur, though, facilitated by the amnesic trait, if similar conditions to the original event(s) ensue.

The recovery from amnesia may at times involve vivid partial recollections (such as flashbacks) of the (traumatic) event, also called hypermnesic phenomena. These are certainly transient states rather than traits. Frankel (1994, 1996) warned, though, against the inference that they represent true memories of previously dissociated events. But then, when the flashbacks do not represent true memories, or the patient presents with "false memories" as has been reported among patients with dissociative amnesia (Merskey, 1995), it might be said not to represent a recovery of amnesia at all. However, here it might be sensible to distinguish between a recovery of cognitive memory and affective memory. Considering that 'false memories' often involve severe childhood trauma irrespective of their veracity (Fonagy & Target, in

press), and that amnesia occurs typically for traumatic events, these false recollections (cognitive) may be substitutes for the memory 'gaps' but with equivalent (true) affective content.

### *1.2.2 Identity confusion and fugue states*

The symptom of identity confusion is defined as a subjective feeling of uncertainty, puzzlement, or conflict about one's identity (Steinberg, 1993). This is often accompanied by a struggle as to who one is, or an inner battle over identity and decisions.

In a fugue, amnesia of sudden origin, thus state-like, is typically accompanied by wandering and disorientation with disruption of the normal sense of identity. In extreme cases, a new identity may be assumed. This may occur consequent to severe psychological stressors or depression, but also in complex partial seizures, alcohol intoxication or withdrawal, carbon monoxide poisoning, metabolic abnormalities, and head injury (Lishman, 1987; Riether & Stoudemire, 1988; Gelder et al., 1989). Some authors emphasise differences between so-called psychogenic fugues and organic amnesias, for example, loss of personal identity in psychogenic fugues contrasted with repetitive questioning in transient organic amnesic states (Kopelman et al., 1994a, 1994b); preservation of memory of news events during a psychogenic fugue, but loss of all memory during organic amnesias (Kapur, 1991); and the specific failure to learn paired associates of the Wechsler Memory Scale despite improvements on other subtests in certain 'organic' amnesias (Saling, 1991). These differences may, nevertheless, reflect contrasts between the cortical areas implicated, rather than absolute differences in mechanism.

Other authors have acknowledged a mixed pathogenesis, attributing fugues to suggestive elaboration following concussion and amnesia resulting from head injury (Berrington et al., 1956). The neurophysiology of epilepsy might prove valuable for the neurophysiology of fugues, especially in the light of the phenomenological overlap between non-epileptic fugues and ictal and postictal automatisms as noted by Lishman (1987). For example, the origin of complex and elaborated ictal and postictal automatisms in the frontocingulate or orbitofrontal cortex (Broglia et al., 1992), may be linked to the neurophysiological site of disturbance in fugues.

A fugue may be characterised further by reversible changes in the sense of identity. Although the physiological basis of such changes is less clear, Baron-Cohen et al. (1994) have associated the right orbito-frontal cortex with self-concept in SPECT studies of normal adult volunteers. Such changes in the state of self-concept might have links with an alteration of identity.

### *1.2.3 Alteration of identity*

Identity alteration is defined as objective behaviours that are manifestations of the assumption of different identities, such as referring to oneself by different names or being called by different names, observing that one possesses a learned skill for which one cannot account, discovering items in one's possession that one is unaware of having acquired, being told by others that one has been acting like a completely different person, or severe, sudden changes of mood or voice (Steinberg, 1993).

Alterations of personal identity are sometimes called 'switches'. These exemplify changing states, and these states alter rapidly for some patients. Physiological changes associated with alteration in identity states may illustrate the link between physiological states and dissociative states in a clearer way than for the

other dissociative symptoms, precisely for the reason that the alteration of identity states represent such a demarcated change of state. Sudden switches in subjective states of this kind may correspond to observable disjunctions in brain states. This cue for further research has not really been taken up yet, except by the following research teams. Cocker et al. (1994) reported increased frontal delta activity on EEG as the child alter identity of a patient with DID announced itself under hypnosis. Although evidence of consistent relationships between apparent identity shifts and physiological changes is tenuous at present, it could illustrate a different paradigm by which psychological and physiological dissociations were identified with each other. Furthermore, Larmore et al. (1977) reported differences in visual cortex event-related (electric) potentials across alter personalities in a patient with DID.

#### *1.2.4 Depersonalisation and derealisation*

Although depersonalisation and derealisation are accepted by many as dissociative, and are regularly included in scales of dissociation (see next chapter, Table 2.1) and DSM-IV (1994), historically such a link has not always been supported clearly, with some authors doubting its relevance to dissociation (Merskey, 1995). The viewpoint by some has been that depersonalisation belongs in the realm of anxiety: Roth (1969) described phobic anxiety-depersonalisation states as one of three phobic anxiety states, alongside simple phobias and social phobias. Sedman (1970) favoured an association between depersonalisation and depressed mood above 'organic' theories of depersonalisation.

Nonetheless, depersonalisation and derealisation are well-recognised symptoms in epilepsy. Complex partial seizures originating from both temporal and frontal lobes have been associated with depersonalisation in the aural, ictal, and



postictal phases (Lishman, 1987; Bancaud & Talairach, 1992; Broglin et al., 1992; Wieser et al., 1992; Luciano, 1993). Depersonalisation has been induced by the use of marijuana and alcohol (Melges et al., 1970, 1974; Mathew et al., 1993), by fluoxetine (Black & Wojcieszek, 1991; Hollander et al., 1992a), L-dopa (Chen, 1991), nitrazepam withdrawal (Terao et al., 1992), and staring experiments (Miller et al., 1994). Such depersonalisation, which comes and goes in attack-like fashion, thus state-like, has been linked to left hemispheric frontal-temporal activation and decreased left caudate perfusion (Hollander et al., 1992b).

### *1.2.5 Dissociative symptoms in non-dissociative disorders*

It is important to mention that the above dissociative symptoms occur also in non-dissociative disorders. They occur in epilepsy (Lishman, 1987), head injury and cognitive disorders (Nemiah, 1975b, 1989), substance abuse and intoxication (Dunn et al., 1993; Saxe et al., 1993), anxiety disorders (Goff et al., 1992; Van Der Kolk, 1994), somatoform disorders (Saxe et al., 1994), depressive and other mood disorders (APA, 1994), psychotic disorders (Steinberg et al., 1994), eating disorders (Demitrack et al., 1990), in intrafamilial child abuse (Putnam, 1989), in malingering and factitious disorder (APA, 1994), and in personality disorders (Bruce-Jones & Coid, 1992). A link between borderline personality disorder (BPD) and dissociation is strongly suggested by the inclusion of dissociation as a diagnostic criterion for BPD in DSM-IV (APA, 1994).

This overlap of dissociative symptoms and other disorders may be quite common, as Putnam (1989) suggests in his referral to unpublished data, where significant dissociative symptoms (including depersonalisation and flashbacks) were reported by 41% of a sample of 311 psychiatric patients who did not meet DSM-III-R

criteria for a dissociative disorder. However, it is not clear from what disorders these patients did suffer, and therefore the potential significance of this perhaps liberal figure is weakened.

### *1.2.6 Other dissociative symptoms*

Some archaic symptoms, mostly state-like, such as automatic speech, sudden blindness, hypochondriacal symptoms (Merskey, 1995), and parasomnic phenomena (Janet, 1907/1965), have received only limited recent interest in research on dissociation (Alvarado, 1989; Schenck et al., 1989; Hacking, 1991). Besides these, many other symptoms, usually associated with other pathology, have also been attributed to dissociation, including all the principal varieties of (pseudo)hallucinations, passivity experiences, involuntary movements (Counts, 1990; Spiegel, 1991a; Putnam, 1994); sudden changes of affect or behaviour (Loewenstein, 1991); alterations in time sense (Melges, 1982), and even thought disorder (Putnam, 1989).

If alteration in consciousness states is a feature of dissociation at all, as suggested by Janet's (1907/1965) inclusion of somnambulism as a manifestation of dissociated consciousness, then the neurophysiology on alterations in states of wakefulness might inform us on dissociation. In fact, parasomnic phenomena are very good examples of 'states'. Following West's (1967) analysis of correlations between EEG traces suggestive of hyperarousal sleep during hypnosis and dissociative reactions, Mahowald & Schenck (1991) discussed dissociations between wakefulness and sleep. While polysomnographic recordings allow differentiation between three basic states (wakefulness, REM and NREM sleep), attention to behaviour and subjective reports alongside recordings leads to recognition of many kinds of

inconsistency between these, such that a dissociation arises. Examples would include the intrusion of REM into wakefulness leading to (pseudo)hallucinations, of REM into NREM leading to night terrors or sleepwalking, or of wakefulness into REM leading to behaviour disorders or lucid dreaming. Mahowald and Schenk point out that such dissociated physiological states arise both as the consequence of neurological disturbance, as well as from stress and pathological affect. They hypothesise PTSD, nocturnal panic attacks, and psychogenic dissociative states as reflecting sleep/wakefulness dissociations of this kind. They point out how new state dissociations are continuing to be identified and this makes it more reasonable to propose that polysomnographic criteria be introduced to distinguish between states that are truly dissociated, and uninterrupted wakefulness or sleep. This could further stimulate study of the parasomnias and other sleep disorders where behavioural and subjective discontinuities are linked to relatively complex disruptions of background EEG states.

In offering a potential route by which dissociation can refine its meaning in a very different scientific culture to Janet's, a model based on sleep/wakefulness dissociations would revive two Janetian themes. First, a detailed illustration of the inseparability of biological and psychological events in dissociation would update a fundamental assumption of his work. Second, a renewed interest in parasomnias giving rise to somnambulism would ensure such state-like phenomena as he used to typify dissociation were no longer neglected in a research environment where studies relating to trait aspects of dissociation have dominated the scene during the last few decades.



### 1.3 *Dissociative mental phenomena*

Dissociation was one of several terms originally used by Pierre Janet (1889/1930, 1907/1965) in the previous century to describe the detachment or dis-association between parts of consciousness. He reserved dissociation (rather than *désagrégation* or *dédoublement*) to refer to an active process of varying degree in which parts of consciousness are separated. It could render some memories harder to retrieve, or place them out of reach altogether, or lead to a complete 'disaggregation' of the personality. Dissociation was an immediate consequence of strong emotion, but predisposition to it reflected the presence of 'fixed ideas' and inherited biological vulnerability (Janet, 1907/1965, 1914). The vulnerability, one could say, represents the traits for dissociation, and traits could also be reflected in the case of a 'disaggregation' of the personality. Morton Prince (1905/1908) took the trait-like features of dissociation further precisely in terms of personality, by taking Miss Beauchamp's constellations of dissociative experiences as belonging to separate personalities.

Janet's account emphasised a biological predisposition to dissociation, and he described it as the process in which innate divisions between psychological functions were revealed (Janet, 1889/1930, 1914). However, it was subsequently likened to the psychological defences of psychoanalytic literature, being seen as an active process explicable in psychodynamic terms.

Psychodynamic theorists usually view dissociation as a trait-like phenomenon. They have carefully distinguished dissociation from defences of repression and splitting that resemble it in their operation and effects. Freud (1900/1953) described dissociation (and psychical splitting) as a possible consequence of the primary defence

of repression. In contemporary psychoanalytic literature, dissociation is now more often considered a distinct mechanism alongside repression and splitting (Tillman et al., 1994). Gabbard (1994) summarises a common view of the relationship of repression to dissociation:

"In the case of repression, a horizontal split is created by the repression barrier, and the material is transferred to the dynamic unconscious. By contrast, a vertical split is created in dissociation so that mental contents exist in a series of parallel consciousnesses."

Dissociation has also been distinguished from repression insofar as the former defends against trauma at the time that the trauma occurs, while the latter defends against wishes, dreams and memories (Spiegel, 1990, 1991a; Classen et al., 1993).

Melanie Klein (1946/1988) illustrated that splitting was the primary mechanism in the infantile paranoid-schizoid position, and could lead to "states of depersonalisation and of schizophrenic dissociation" in adulthood. More recently, Allen (1993) and Gabbard (1994) discriminated between dissociation as a cleavage between autonomous ego states, and splitting as a division between good and bad internal objects. Gabbard (1994) translates this into observations that impulse control and tolerance for anxiety and frustration are specifically impaired in splitting, whereas disturbances of memory and consciousness are more evident in dissociation.

Dissociation has also been claimed to be primary to either repression or splitting (Counts, 1990; Grotstein, 1981), as well as a neutral, non-defensive mental process (Kihlstrom & Hoyt, 1990; Kihlstrom et al., 1994). Hilgard's (1977) neo-dissociation theory is consistent with this, describing how hypnotically induced fractionation of an information-processing and monitoring function results in a "vertical split" in consciousness, with a parallel stream of cognitions attributed to a

"hidden observer". Others regard dissociation as neither constitutional ('trait'), nor a spontaneous or induced 'state', but as skilful deception of oneself and others (Sarbin, 1994; Beahrs, 1994).

Alongside the intrapsychic meaningfulness of dissociation, a variety of extraordinary experiences have been designated as 'dissociative'. These are more or less all state-like experiences with the exception of the trait-like 'responsiveness to suggestion'. Traditionally, these include hypnotic 'trance' states, somnambulism and automatic writing (Janet, 1907/1965). West (1967) also cites dreams, hypnagogic states, sleep paralysis, "highway hypnosis", trances and ecstasies in mystical and religious rites, fascination or fixation in flyers, daydreaming, and the exercise of normal concentration at all levels of intensity, as dissociative experiences. Gabbard (1994) acknowledges the continuity between transient feelings of strangeness, "spacing out" in monotonous situations, or becoming "entranced" by movies, television, or books, and dissociative symptoms. Gabel (1989) considers dreams as normal manifestations of a dissociated self-monitoring system, activated during the biological changes of sleep. Krippner (1994) briefly refers to potentially positive uses of dissociation, namely pain control, marathon athletes' use of dissociation as a perseverance strategy, and the "tuning out" of a boring conversation.

The question arises whether the dissociative experiences, as states and traits, are necessarily pathological or on a continuum with ordinary experiences. They could be said to be on a continuum with personality, thus being trait-like personality features. Waller et al. (1996), arguing against a dissociative continuum, point out that evidence supporting the trait model of dissociation derives primarily from studies on 'non-pathological dissociation' such as investigations of hypnotisability and absorption. The trait model is supported similarly by psychodynamic theorists who



favour a continuum on the basis that dissociation represents psychological mechanisms (for example, defence mechanisms) of people irrespective of their suffering from a disorder. Although the results of studies by Putnam et al. (1996) and Waller et al. (1996) contradict such a continuum, depressed and anxious feelings, commonly viewed on a continuum with ordinary experiences, might serve as an analogy for dissociation. Such an analogy suggests then people have more or less of a dissociative ‘trait’, and experiences that are more or less dissociative ‘states’.

#### ***1.4 Examining dissociative states***

It is standard scientific practice to base research on the *measurement* of variables. For this, measuring instruments prove very useful and some even consider them necessary. Congruently, the measurement of dissociative symptoms has emerged over the last few decades as a way to study dissociation in clinical samples. This way of examining dissociative states further will be followed, together with the study of neurophysiological correlates to dissociation. Therefore, the plan for the thesis is to examine dissociative states in three complementary ways:

##### ***1.4.1 Assessment of existing measures of dissociation for state and trait characteristics***

Previous measures of dissociation are all measures of trait characteristics, as will be demonstrated in a comprehensive study of existing scales in Chapter 2. Since there is overwhelming evidence, as noted in this chapter (Chapter 1), for state characteristics of dissociation, a measure that is sensitive for precisely these characteristics is necessary to examine them.

### *1.4.2 Development and psychometric testing of a measure of dissociative states*

The development of a state measure of dissociation will follow next. This development and testing of a state-sensitive scale itself will serve as a way of examining state features of dissociation in at least two ways: first, the development of the state-sensitive scale will be based on past studies of dissociative experiences with particular highlighting of state-like features, and second, the psychometric testing of the state-sensitive scale in clinical samples is likely to reveal more about the dissociative states in those samples if the scale is to measure dissociative states at all.

Chapter 3 is a focused review of methods for the development and psychometric testing of a psychiatric rating scale. Chapter 4 describes the construction of the State Scale of Dissociation. Chapters 5 - 7 are devoted to the design and methods, the results, and the discussion of the psychometric validation and reliability testing of the SSD respectively.

### *1.4.3 Concurrent neurophysiological correlates to dissociative states*

Dependent on the measure of dissociative states, of which the development and psychometric testing will be covered in Chapters 4 - 7, the dissociative states will be examined for concurrent neurophysiological correlates in Chapters 8 -10. Without a state measure, correlations between neurophysiological parameters and measured dissociative experiences are not correlations of states with states. At the most, without a state measure, measured dissociative traits could be tested for correlation with either neurophysiological states or neurophysiological traits. However, the availability of a state measure would make it possible for the first time to study the concurrent neurophysiological correlates of measured dissociative states.

The particular concurrent neurophysiological parameters that may correlate with the dissociative states, for examination in Chapters 8 - 10, are electro-encephalographic states. The study that comes closest to a previous examination of this, was that of Cocker et al. (1994), who reported increased frontal delta activity on EEG as the child alter identity of a patient with DID announced itself under hypnosis. The main shortfall, though, is that their study did not measure the dissociative experience. Furthermore, it was confined to one patient and limited to identity alteration in DID. Others did not investigate electro-encephalographic correlates of dissociative disorders or symptoms, but studied EEG correlates of hypnosis and suggestibility. In a study by Sabourin et al. (1990), highly hypnotisable subjects had substantially more theta activity than did 'low' hypnotisable subjects in occipital, central, and frontal regions during most of the varied experimental conditions. However, in this study both the 'low' and the 'high' hypnotisable subjects showed significant increases of mean theta power between initial wakefulness and hypnosis. Regarding beta activity, highly hypnotisable subjects showed significant asymmetry between left and right hemispheres with greater beta power on the left in comparison with low hypnotisable subjects. In contrast with the reactivity of theta power, beta power showed no response other than fading out gradually as the experiments progressed.

In setting up the study for this thesis, it should be borne in mind from the outset that there are several limitations in the apprehension of the potential neurophysiological correlates of dissociation. These include the inability of a correlation to indicate whether the relationship between the neurophysiological correlates and dissociation is causal or consequential, that is, whether the neurophysiological correlates are causal factors or consequences of dissociation. Furthermore, underlying



seizure activity, brain damage, and medication, for which most of the previous studies have not had controls, might confound the relationship between neurophysiological parameters and dissociation.

**Table 1.1** Classifications of dissociative disorders

ICD-10 (WHO, 1992)			DSM-IV (APA, 1994)	
F44	Dissociative [conversion] disorders		(Somatoform disorders)	
			300.11	Conversion disorder
F44.4	Dissociative motor disorders	↔		- with motor symptom / deficit
F44.5	Dissociative convulsions	↔		- with seizures / convulsions
F44.6	Dissociative anesthesia and sensory loss	↔		- with sensory symptom / deficit
				- with mixed presentation
				Dissociative disorders
F44.0	Dissociative amnesia	↔	300.12	Dissociative amnesia
F44.1	Dissociative fugue	↔	300.13	Dissociative fugue
F44.2	Dissociative stupor	→		Under 300.15
F44.3	Trance and possession disorders	→		Under 300.15
F44.7	Mixed dissociative [conversion] disorders			
F44.8	Other dissociative [conversion] disorders			
	.80 Ganser's syndrome			
	.81 Multiple personality disorder	↔	300.14	Dissociative identity disorder
	.82 Transient dissociative [conversion] disorders			
	occurring in childhood and adolescence			
	.88 Other specified dissociative [conversion] disorders			
F44.9	Dissociative [conversion] disorder, unspecified	↔	300.15	Dissociative disorder NOS
F48	(Other neurotic disorders)			
F48.1	Depersonalisation-derealisation syndrome	↔	300.6	Depersonalisation disorder

# ***Part II - The State Scale of Dissociation: Development and psychometric validation***

## **2**

### **Assessment of existing measures of dissociation**

A systematic literature review informed the supplementary study described in this chapter, in order to introduce and examine existing measures of dissociation. This aim (section 2.1) follows from Chapter 1 (section 1.4.1), where the need for a state measure of dissociation was pointed out – both as a way to examine state features of dissociation, and as a tool to make possible the study of concurrent neurophysiological correlates of measured dissociative states. The objectives (section 2.2) direct the review of the existing measures of dissociation in order to examine them for state characteristics and for what they measure, and to note how they were validated psychometrically. The design section (section 2.3) will outline the plan for the assessment of existing measures of dissociation. The methods section (section 2.4) will detail the process of assessment of individual scales. The section on results (section 2.5) will be presented under the headings of the objectives. The conclusions (section 2.6) summarise the main findings of the study.

#### ***2.1 Aim***

The aim of this chapter is to introduce and examine existing measures of dissociation, paying special attention to their suitability for measuring dissociative states at the time that these states occur.



## **2.2 Objectives**

The objectives of this chapter are:

*2.2.1 To describe existing measures of dissociation*

*2.2.2 To examine what the different scales of dissociation measure*

*2.2.3 To assess existing scales for their suitability to measure dissociative states at the time that these states occur.*

*2.2.4 To assess how the measures of dissociation were validated psychometrically*

## **2.3 Design**

*2.3.1 The scales that measure dissociative symptoms*

Dissociative symptoms do not only occur during the course of the dissociative disorders, but also during other psychiatric and non-psychiatric disorders, and non-pathological conditions (Chapter 1, sections 1.3.5; 1.3.6; 1.4). The search for scales that address dissociative symptoms, therefore, had to be wide and covered other psychiatric measures, measures of epilepsy, and measures of personality.

*2.3.2 Assess each scale*

In addition to assessing the suitability of each scale as a state scale, the objective was to assess the domain or symptom clusters of each scale and their overlap, its psychometric validation, and shared characteristics among the different scales.

## **2.4 Methods**

### **2.4.1 Search for scales containing items relating to dissociation**

#### **2.4.1.1 Databases**

Computerised databases were searched for published reports of empirical studies on dissociation. Where these studies made use of specific measures of dissociation, the articles were studied for further information about the measures. The databases were then searched further for other references to the same measures, and the articles studied for further information about the measures. The following databases were searched:

- a) MEDLINE
- b) PsycLIT.

#### **2.4.1.2 References cited in journal articles**

The reference lists of published reports found by the above method were studied for related articles and sources of background information to measures of dissociation.

### **2.4.2 Assess each scale according to the objectives of this chapter**

The assessment of each scale that was found by the above method, was summarised as follows:

1. A description of the type of scale
2. The origins of items in each scale
3. The subscales or symptom clusters of each scale
4. The ways in which responses to items are graded
5. The populations where the scale was tested
6. The psychometric validation of each scale \*
7. The time frame specified for the rating of the dissociative experiences
8. Evaluative comments.

\* The section on the psychometric validation of each scale represents a summary of all published results of validation and/or reliability testing performed during the

development of the particular scale. Where no mention is made of a specific test of validity or reliability, this should be taken to mean that such a test had not been performed during the psychometric validation of that scale.

## **2.5 *Results***

The results of the assessment of the various scales are presented as descriptions of the existing measures of dissociation, as an assessment of what the different scales measure, as an assessment of their suitability for measuring dissociative states at the time that these states occur, and their psychometric validation.<sup>2</sup>

### **2.5.1 *Description of existing measures of dissociation***

The existing scales are described and compared.

#### **2.5.1.1 The existing measures of dissociation**

Table 2.1 lists the existing rating scales of dissociative experience, or measures of dissociation. The table summarises the authors, the types of scale, the number of items, and the symptom clusters. The list follows the chronological order of publication, and then the alphabetical order of the authors.

These measures all focus on dissociative experiences, even if the dissociative experiences represent one section of the measure. In some of the scales, several other symptom groups are also covered, but in order to be included, dissociative symptoms had to be covered specifically and explicitly. For example, some of the scales cover various post-traumatic experiences, of which dissociative experiences form a large part.

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<sup>2</sup> In the course of assessing the psychometric validation of scales, various terms related to validation and reliability testing are used, but they will be explained in detail only in Chapter 3 for the sake of fluency of this chapter.



### **2.5.1.2 Dissociative items in measures from other subject areas**

Dissociative items are also found in measures of epilepsy, measures of general psychopathology, and measures of psychosis.

#### **2.5.1.2.1 *Measures of epilepsy***

Observations of dissociative symptoms among patients with complex partial epilepsy, as well as EEG abnormalities among patients with dissociative disorders (Schenk & Bear, 1981; Lishman, 1987; Coons et al., 1988), prompted an investigation of questionnaires about complex partial epilepsy-like symptoms (see below: Bear & Fedio, 1977; Persinger & Makarec, 1987; Makarec & Persinger, 1990; Roberts et al., 1990). The greater parts of these questionnaires dealt with symptoms of hypergraphia, intuition, paranormal experiences, “hypermoralism”, obsessionalism, viscosity, and autonomic symptoms. Only a minority of items overlapped with dissociative symptoms, and these are indicated below and in the section on the origins of every item of the SSD (Chapter 4).

#### **2.5.1.2.2 *Measures of general psychopathology***

These measures include dissociative symptoms among others such as depressive, anxiety, and somatic symptoms, for example, the Present State Examination (Wing et al., 1974). The dissociative symptoms are not always specified in these scales.

#### **2.5.1.2.3 *Measures of psychosis***

The clinical entity of pseudohallucinations is an example of a symptom at the interface of dissociation and psychosis. Such examples in measures of psychosis are discussed under section 2.5.1.3.4.

### **2.5.1.3 Assessment of individual scales**

Each scale was assessed according to the objectives of this chapter (section 2.2), and is presented according to its subject area of origin.

#### **2.5.1.3.1 *Measures of dissociation***

##### **2.5.1.3.1.1 Depersonalisation Inventory / DPI (Dixon, 1963)**

###### **2.5.1.3.1.1.1 Description**

Dixon listed 12 symptoms of depersonalisation in an untitled table, but it was Melges et al. (1970) who dubbed it the “Depersonalisation Inventory”. It is a self-rating, Likert-type scale.

###### **2.5.1.3.1.1.2 Origins of items**

It consisted originally of 70 extraversion-intraversion items, drawn from clinical experience, and a lie scale.

###### **2.5.1.3.1.1.3 Subscales or symptom clusters**

Apart from the lie scale, all the items pertain to the single symptom of depersonalisation.

###### **2.5.1.3.1.1.4 Grading of responses**

This is a frequency measure and does not measure the severity of the experiences.

###### **2.5.1.3.1.1.5 Population where scale tested**

The DPI was tested in 69 male and 58 female college psychology students.

###### **2.5.1.3.1.1.6 Methods of validation**

From the original 70 items, 43 items that represented a large “self-alienation” cluster were derived statistically (by group cluster analysis). The 2 remaining smaller clusters

(mystical experience and hallucinatory experience) were excluded, as were self-alienation items that showed centroid factor loadings below 0.50, such as experiences of distortion of one's body, feelings of déjà vu, ideas of reference, and talking to oneself.

#### **2.5.1.3.1.1.7 Time frame of the scale**

The inventory gives an indication of the number of times during the previous year, if at all, that the respondent experienced depersonalisation.

#### **2.5.1.3.1.1.8 Comment or evaluation**

The inventory does not address any dissociative symptoms other than depersonalisation.

### **2.5.1.3.1.2 Dissociative Experiences Scale / DES (Bernstein & Putnam, 1986)**

#### **2.5.1.3.1.2.1 Description**

The Dissociative Experiences Scale, a 28-item self-report measure, has been subject to more studies of validity and reliability than any of the other scales on dissociation (Ross et al., 1988; Carlson et al., 1993; Carlson & Putnam, 1993; Ellason et al., 1994).

#### **2.5.1.3.1.2.2 Origins of items**

The items were drawn from clinical experience.

#### **2.5.1.3.1.2.3 Subscales or symptom clusters**

The 28 items cover various dissociative experiences, but these are not grouped into subscales. The three clinically useful factors were derived by factor analysis.



#### 2.5.1.3.1.2.4 Grading of responses

The DES originally used a visual analogue scale, which allowed the subject to indicate any possible frequency for their dissociative experiences. The visual analogue version was later updated (Carlson & Putnam, 1993) to present a series of 11 fixed frequencies from which the subjects had to ring the one corresponding most closely to their own frequency of experiences, e.g., 0%, 10%, 20%, 30%, ..., 100% of the time. However, the DES does not allow for an expression of the severity of a symptom, regardless of its frequency.

#### 2.5.1.3.1.2.5 Population where scale tested

The scale was originally tested in samples of normal adults and psychiatric patients with various diagnoses. The distribution of DES scores has been graphically represented by diagnostic group (Bernstein & Putnam, 1986). The update on the DES (Carlson & Putnam, 1993) provides a table that summarises mean or median DES scores from a wide range of clinical and non-clinical populations. Ross et al. (1995) later tested the DES in a sample of 274 patients with multiple personality disorder.

#### 2.5.1.3.1.2.6 Methods of validation

The DES measures 3 main factors: amnesia, depersonalisation / derealisation, and absorption / imaginative involvement. Ross et al. (1991) performed a factor analysis in a sample of 1055 members of the general population and found, amongst other results, a higher mean DES score than the 5 studies quoted in Carlson & Putnam (1993). The latter article shows a table summarising the results of studies of the reliability of the DES, including test-retest reliability, and split-half and Cronbach's alpha methods of determining internal consistency. Unfortunately its divergent validity was only tested in relation to unrelated demographic variables, such as socioeconomic

status (Carlson & Putnam, 1993). In the sample of patients with multiple personality disorder (Ross et al., 1995), a principal components analysis with varimax rotation yielded three factors that corresponded with those in the general population.

#### **2.5.1.3.1.2.7 Time frame of the scale**

The DES measures the usual frequency of dissociative experiences and is not limited to a specific period, thus presuming the capacity for dissociation to be an enduring feature, something similar to a personality trait.

#### **2.5.1.3.1.2.8 Comment or evaluation**

Criticisms of the construct validity of the DES appear to reflect its use of a wide pool of symptomatic and non-symptomatic items (Piper, 1994), as it fails to identify “true cases” (Chu & Dill, 1990) with high scores corresponding to general psychopathology (Tillman et al., 1994). While the temporal stability of DES scores makes it useful for diagnostic purposes, Dubester et al. (1995) point out its inappropriateness for use in outcome research because it was not designed to be sensitive to recent changes in dissociation brought about by treatment. This insensitivity also limits its application in studies of concurrent neurobiological correlates of dissociation.

### **2.5.1.3.1.3 Perceptual Alteration Scale / PAS (Sanders, 1986)**

#### **2.5.1.3.1.3.1 Description**

This self-report, Likert-type scale contains 60 items.

#### **2.5.1.3.1.3.2 Origins of items**

The items were initially selected from the Minnesota Multiphasic Personality Inventory / MMPI (Hathaway & McKinley, 1970).

#### **2.5.1.3.1.3.3 Subscales or symptom clusters**

The 60 items are not grouped into subscales.

#### **2.5.1.3.1.3.4 Grading of responses**

The PAS gives a measure of the frequency of dissociative experiences, but not their severity.

#### **2.5.1.3.1.3.5 Population where scale tested**

It was originally tested in college students.

#### **2.5.1.3.1.3.6 Methods of validation**

Cronbach's alpha demonstrated internal consistency, and no items were rejected. After factor analysis by the principal components method with a Promax rotation, 3 factors emerged: modification of affect, modification of control, and modification of cognition. However, the factor analysis was performed only on the 37 items that distinguished students who binged from students who did not binge.

#### **2.5.1.3.1.3.7 Time frame of the scale**

As for the DES, the PAS measures the usual frequency of dissociative experiences and is not limited to a specific period in time, thus presuming the capacity for dissociation to be an enduring feature.

#### **2.5.1.3.1.3.8 Comment or evaluation**

The PAS gives a measure of the frequency of dissociative experiences and therefore the same limitations would apply as for the DES. Furthermore, the validity of the PAS as a measure of dissociation is lessened by its significant correlation with a number of measures of affect, including the Beck Depression Inventory (Beck et al., 1961).



#### **2.5.1.3.1.4 Questionnaire of Experiences of Dissociation / QED (Riley, 1988)**

##### **2.5.1.3.1.4.1 Description**

The QED is a 26-item, self-rating scale.

##### **2.5.1.3.1.4.2 Origins of items**

The items were drawn from clinical experience.

##### **2.5.1.3.1.4.3 Subscales or symptom clusters**

The following types of experiences are covered: amnesia, depersonalisation, derealisation, identity alteration, detachment, trance, and imagination.

##### **2.5.1.3.1.4.4 Grading of responses**

Its true/false format does not allow for grading of responses.

##### **2.5.1.3.1.4.5 Population where scale tested**

It was tested mainly in the general population. Small groups of patients with somatisation disorder and multiple personality disorder showed higher scores.

##### **2.5.1.3.1.4.6 Methods of validation**

Cronbach's alpha method confirmed internal consistency.

##### **2.5.1.3.1.4.7 Time frame of the scale**

It gives an indication of the lifetime prevalence of dissociative experiences.

##### **2.5.1.3.1.4.8 Comment or evaluation**

Because of its time frame, the same limitations would apply as for the DES.

#### **2.5.1.3.1.5 Dissociative Disorders Interview Schedule / DDIS (Ross et al., 1989)**

##### **2.5.1.3.1.5.1 Description**

The DDIS is a 131-item, structured, interviewer-based, diagnostic questionnaire in 16 sections. The end result may be a DSM-III diagnosis. The DDIS can be administered in 30-45 minutes, by nurses, social workers, psychologists, physicians, and other mental health professionals.

##### **2.5.1.3.1.5.2 Origins of items**

The DDIS was based on the authors' clinical experience with 23 patients with multiple personality disorder (MPD) and a review of the literature.

##### **2.5.1.3.1.5.3 Subscales or symptom clusters**

The sections test for somatic complaints, substance abuse, psychiatric history, major depressive episodes, Schneiderian first rank symptoms, trances / sleepwalking / childhood companions, childhood abuse, features associated with MPD, supernatural / possession / ESP experiences / cults, borderline personality disorder, psychogenic amnesia, psychogenic fugue, depersonalisation disorder, multiple personality disorder, atypical dissociative disorder, and concluding items.

##### **2.5.1.3.1.5.4 Grading of responses**

Most of the questions are answered Yes, No, or Unsure, and scored accordingly.

##### **2.5.1.3.1.5.5 Population where scale tested**

It was tested in 80 psychiatric patients, of whom 20 presented with MPD, 20 with schizophrenia, 20 with panic disorder, and 20 with eating disorders.

#### **2.5.1.3.1.5.6 Methods of validation**

The results confirmed inter-rater reliability, test-retest reliability, and specificity of 100% and sensitivity of 90% for the diagnosis of MPD.

#### **2.5.1.3.1.5.7 Time frame of the scale**

The DDIS gives an indication of the lifetime prevalence of most of the symptoms.

#### **2.5.1.3.1.5.8 Comment or evaluation**

The statistical relationships among the sections and the total DDIS are not reported, therefore the question of a central core of dissociative symptoms is left unanswered.

### **2.5.1.3.1.6 Dissociation Scale for Symptom Checklist (SCL-90) and Hopkins Symptom Checklist (HSCL) / "HSCL-D" (Briere & Runtz, 1990)**

#### **2.5.1.3.1.6.1 Description**

This scale was designed to complement the SCL-90 and HSCL. It contains 13 items and is a self-rating, Likert-type scale. One of its benefits is that it can be integrated with the SCL-90 and HSCL, permitting analysis of dissociative symptomatology in comparison to other, equivalently scored symptom scales.

#### **2.5.1.3.1.6.2 Origins of items**

The items were developed on a "rational-intuitive" basis.

#### **2.5.1.3.1.6.3 Subscales or symptom clusters**

The items are not grouped into subscales.

#### **2.5.1.3.1.6.4 Grading of responses**

It gives an indication of the presence and severity of the symptoms.

#### **2.5.1.3.1.6.5 Population where scale tested**

It was tested in female undergraduate university students.

#### **2.5.1.3.1.6.6 Methods of validation**

Its internal consistency was confirmed by high alpha coefficients.

#### **2.5.1.3.1.6.7 Time frame of the scale**

It covers the previous 7 days, including the day of completion of the questionnaire.

#### **2.5.1.3.1.6.8 Comment or evaluation**

The non-clinical nature of the study population and the fact that its validity was not tested, contra-indicates its use as a clinical measure.

### **2.5.1.3.1.7 Structured Clinical Interview for DSM-IV Dissociative Disorders / SCID-D (Steinberg et al., 1990, 1993, 1994; first published as a DSM-III-R version, later for DSM-IV)**

#### **2.5.1.3.1.7.1 Description**

This is a semi-structured, interviewer-based, diagnostic clinical interview consisting of 277 questions.

#### **2.5.1.3.1.7.2 Origins of items**

The origins of the 5 core symptom groups listed below are not explained.

#### **2.5.1.3.1.7.3 Subscales or symptom clusters**

The items are arranged into 5 core symptom groups: amnesia, depersonalisation, derealisation, identity confusion, and identity alteration.



#### **2.5.1.3.1.7.4 Grading of responses**

The items include severity ratings.

#### **2.5.1.3.1.7.5 Population where scale tested**

The interview was submitted to field tests with 7 normal controls and 41 psychiatric patients suffering from DSM-III-R schizophrenia, major depression, PTSD, generalised anxiety disorder, or dissociative disorders.

#### **2.5.1.3.1.7.6 Methods of validation**

The 5 core symptoms are said to yield good discriminant validity (both for the severity of specific dissociative symptoms and the presence / absence of dissociative disorder, by analysis of variance). The core symptoms are also said to yield good inter-rater reliability (by weighted Kappa statistics).

#### **2.5.1.3.1.7.7 Time frame of the scale**

The interview measures lifetime prevalence and frequency of the dissociative symptoms.

#### **2.5.1.3.1.7.8 Comment or evaluation**

Further psychometric validation is needed, especially of the coherence of the 5 core symptoms.

### **2.5.1.3.1.8 Trauma Symptom Inventory / TSI (Briere, 1991, 1992, 1995)**

#### **2.5.1.3.1.8.1 Description**

This is a self-report, Likert-type questionnaire consisting of 100 items.

#### 2.5.1.3.1.8.2 Origins of items

The TSI was developed in order to improve and expand on the TSC-33/40 (see below). The initial item pool consisted of 182 statements; 19 items were removed after consultation with trauma-specialised clinicians.

#### 2.5.1.3.1.8.3 Subscales or symptom clusters

The symptoms fall under 10 clinical scales (anxious arousal, depression, anger / irritability, intrusive experiences, defensive avoidance, dissociation, sexual concerns, dysfunctional sexual behaviour, impaired self-reference, and tension reduction behaviour) and 3 validity scales (atypical response, response level, and inconsistent response).

#### 2.5.1.3.1.8.4 Grading of responses

The responses may range between 0 (never) and 3 (often).

#### 2.5.1.3.1.8.5 Population where scale tested

After administration to 279 university students and 370 clinical subjects with unspecified diagnoses, a further 19 items were discarded as redundant, and another 54 items, considered to be the most redundant or least understandable, were said to be removed after analysis of data from 836 individuals from the general population.

Additional normative data are provided from a Navy recruits' sample.

#### 2.5.1.3.1.8.6 Methods of validation

Alpha coefficients showed relatively high internal consistency, and factor analyses produced 3 factors: trauma (including the dissociation scale), self, and dysphoria.

Construct validity was tested by discriminant function analyses between groups of subjects who had or did not have traumatic experiences. The high correlation

coefficients between the TSI clinical scales and the Brief Symptom Inventory subscales reflect their common focus of psychological distress. The prediction by the TSI of a PTSD diagnosis was congruent with current estimates of the incidence of PTSD in the general population, although not actually tested. However, the prediction by the TSI of borderline personality disorder / BPD (independently diagnosed according to DSM-III-R) showed meaningful correlation between only a few of the subscales and BPD diagnosis; the dissociation scale did not predict borderline status.

#### **2.5.1.3.1.8.7 Time frame of the scale**

The scale measures the prevalence of the symptoms in the last 6 months.

#### **2.5.1.3.1.8.8 Comment or evaluation**

Although the TSI is reliable and valid in pinpointing the wide-ranging difficulties of many trauma survivors, the validity of its dissociation scale was not adequately supported by the data presented.

#### **2.5.1.3.1.9 Office Mental State Examination / “OMSE” (Loewenstein, 1991)**

##### **2.5.1.3.1.9.1 Description**

This semi-structured, interviewer-led, diagnostic clinical interview, includes possible mental status examination questions, and was developed primarily through attempts to diagnose MPD naturalistically without intrusive or hypnotic methods.

##### **2.5.1.3.1.9.2 Origins of items**

The questions and examples were drawn from clinical experience.

##### **2.5.1.3.1.9.3 Subscales or symptom clusters**

Several questions cover each symptom in each of 6 clusters - process MPD (5 symptoms), amnesia (9 symptoms), autohypnotic symptoms (8 symptoms), PTSD

symptoms (6 symptoms), somatoform (5 symptoms), and affective symptoms (6 symptoms) - giving a total of 39 symptoms. The questions are interspersed with examples of typical answers given by patients with dissociative disorders and typical features that can be observed from the patient's appearance, behaviour, and impact on the interviewer.

#### **2.5.1.3.1.9.4 Grading of responses**

The format does not allow for grading of responses.

#### **2.5.1.3.1.9.5 Population where scale tested**

Although it is not said to have been tested in any population, it is intended for use with all psychiatric patients.

#### **2.5.1.3.1.9.6 Methods of validation**

No psychometric testing was reported.

#### **2.5.1.3.1.9.7 Time frame of the scale**

The time frame is not specified, but the questionnaire includes present and past symptoms, giving an indication of the lifetime prevalence of the symptoms.

#### **2.5.1.3.1.9.8 Comment or evaluation**

The questionnaire provides a rich source of example symptoms, but does not quantify these in any way.

#### **2.5.1.3.1.10 Trauma Symptom Checklist-40 / TSC-40 (Elliot & Briere, 1992)**

##### **2.5.1.3.1.10.1 Description**

The TSC-40 is a self-report, Likert-type questionnaire consisting of 40 items. It could be seen as a parent scale of the TSI (see above).



#### **2.5.1.3.1.10.2 Origins of items**

The items were drawn from clinical experience.

#### **2.5.1.3.1.10.3 Subscales or symptom clusters**

The subscales include: anxiety, depression, dissociation, sexual abuse trauma index, sexual problems and sleep disturbance.

#### **2.5.1.3.1.10.4 Grading of responses**

The frequency of the experiences is graded, but not their severity.

#### **2.5.1.3.1.10.5 Population where scale tested**

It was tested in a national survey of 2 963 professional women.

#### **2.5.1.3.1.10.6 Methods of validation**

The TSC-40 was found to be reliable and to display predictive validity for childhood sexual victimisation, as tested against the subjects' self-report of a history of abuse. Discriminant structure coefficients and post-hoc univariate t-tests indicated that all of the 5 subscale scores were each significantly higher for sexually abused women than for those with no sexual abuse history. The subscales most associated with abuse characteristics were dissociation and sexual abuse trauma index.

#### **2.5.1.3.1.10.7 Time frame of the scale**

It measures the relative frequency of the experiences in the previous 2 months.

#### **2.5.1.3.1.10.8 Comment or evaluation**

The meaningfulness of the specified period of the symptoms (2 months), if the score predicts a childhood history of sexual victimisation, is not elucidated.

#### **2.5.1.3.1.11 Checklist of dissociative and anxiety phenomena / “CDAP” (Cardena & Spiegel, 1993)**

##### **2.5.1.3.1.11.1 Description**

This is a list of 98 items, in the format of a self-report, Likert-type scale.

##### **2.5.1.3.1.11.2 Origins of items**

The list was generated from a review of previous instruments and the relevant literature assessing reactions to traumatic events, including the proposed criteria for the Dissociative Disorders section of DSM-IV.

##### **2.5.1.3.1.11.3 Subscales or symptom clusters**

The questionnaire encompasses 8 different clusters of phenomena (with the number of items in each in brackets): alterations in perception (12), alterations in cognition (9), memory (13), somatic anxiety (20), derealisation and avoidance (7), depersonalisation (12), nonsomatic anxiety (14), and Schneiderian first-rank symptoms (11).

##### **2.5.1.3.1.11.4 Grading of responses**

The scale ranges from 0 (not experienced) to 5 (very often experienced).

##### **2.5.1.3.1.11.5 Population where scale tested**

It was applied shortly after the San Francisco Bay Area earthquake of 1989, to non-clinical individuals who had been exposed to traumatic events.

##### **2.5.1.3.1.11.6 Methods of validation**

This checklist is not supported by published results of psychometric reliability or validity testing.

#### **2.5.1.3.1.11.7 Time frame of the scale**

It measures the prevalence of various phenomena experienced in the preceding week.

#### **2.5.1.3.1.11.8 Comment or evaluation**

The symptom clusters cover a range of phenomena that is even wider than that suggested by the title. However, the application after the earthquake did suggest that transient dissociative phenomena could be brought about among a considerable percentage of non-clinical individuals exposed to traumatic events, thus questioning the belief that dissociation is merely a personality trait.

#### **2.5.1.3.1.12 Kelley-Kodman Self-report Questionnaire of Dissociation and Multiple Personality / “KKDMP” (Cooper, 1993)**

##### **2.5.1.3.1.12.1 Description**

The “KKDMP” is a 94-question, self-report, Likert-type instrument developed by Ronald L. Kelley and Frank Kodman.

##### **2.5.1.3.1.12.2 Origins of items**

The items were drawn from clinical experience.

##### **2.5.1.3.1.12.3 Subscales or symptom clusters**

Subscales addressed symptoms of memory, mood, physical symptoms, voices, perceptual disturbances, significant others feedback, abuse history, loss of executive control, imagination, and behaviours associated with MPD.

##### **2.5.1.3.1.12.4 Grading of responses**

Only the frequency of the symptoms is graded.

#### **2.5.1.3.1.12.5 Population where scale tested**

The authors had administered the instrument to 3 subject populations (32 university subjects, 32 patients from a general clinic, and 32 patients with MPD), but Dr Kodman's death and Dr Kelley's practice demands put a temporary halt to psychometric testing of the questionnaire.

#### **2.5.1.3.1.12.6 Methods of validation**

The psychometric testing was then undertaken by Cooper, in partial fulfilment of the requirements for the degree of Doctor of Philosophy at the Southern Illinois University at Carbondale. Internal consistency was supported by high alpha coefficients. Due to the size of the samples, construct validity was examined through analyses of internal structure, group differences, patterns of response, correlation studies, and descriptive statistics. The results suggested that the questionnaire and the subscales measured a similar behavioural domain, that significant group differences were demonstrable across the 3 populations, and that a cut-off score distinguished between the university sample and the MPD patients.

#### **2.5.1.3.1.12.7 Time frame of the scale**

It gives an indication of the lifetime prevalence and frequency of MPD symptoms.

#### **2.5.1.3.1.12.8 Comment or evaluation**

One of the strong points of this study was that it examined subscale - total test correlations in order to demonstrate homogeneity of the scale, although this was not confirmed by factor analysis.



### **2.5.1.3.1.13 Dissociation Questionnaire / DIS-Q (Vanderlinden et al., 1993)**

#### **2.5.1.3.1.13.1 Description**

The DIS-Q consists of 63 items assessed by a Likert-type scale. The distinguishing characteristic of this scale is that it specifically measures psychological dissociation, as opposed to somatic dissociation; the latter being measured by the Somatoform Dissociation Questionnaire / SDQ-20 (by an overlapping author group). However, as can be seen from Table 3.2 (Chapter 3), there is some overlap between conversion symptoms and the DIS-Q.

#### **2.5.1.3.1.13.2 Origins of items**

It was originally developed in part from the DES, the PAS, and the QED, and a pool of 95 items was translated into Dutch. Twenty-six items referring to everyday experiences were eliminated after consultation with clinicians experienced in dealing with dissociative disorders.

#### **2.5.1.3.1.13.3 Subscales or symptom clusters**

In addition to gathering demographic information, the questionnaire yields a total score and scores for 4 subscales, which were derived by factor analysis (see below under vi)).

#### **2.5.1.3.1.13.4 Grading of responses**

The scale ranges from 1 (this is not at all applicable) to 5 (this is extremely applicable), but it is not clear to what this range refers - this is discussed below under viii).

#### **2.5.1.3.1.13.5 Population where scale tested**

The retained 69 items were administered to a sample of 374 members of the general population (Dutch and Flemish). The study was replicated in a second sample of 378 members of the Dutch population, and in a group of 261 psychiatric patients with diagnoses of dissociative disorders, PTSD, schizophrenia, eating disorders, and obsessive-compulsive disorder.

#### **2.5.1.3.1.13.6 Methods of validation**

The 4 subscales, derived by factor analysis, are the following: 1) identity confusion / fragmentation (referring to derealisation and depersonalisation); 2) loss of control over behaviour, thoughts, and emotions; 3) amnesia (memory lacunas); and 4) absorption (referring to enhanced concentration). Five items were eliminated since they obtained a Pearson  $r$  value lower than 0.30 on the four factors. The results of the psychometric testing supported a clear factorial structure, good internal consistency, construct validity, and congruent validity (with the DES).

#### **2.5.1.3.1.13.7 Time frame of the scale**

The period for the dissociative symptoms is not specified.

#### **2.5.1.3.1.13.8 Comment or evaluation**

One potential problem is that the period for the dissociative symptoms is not specified: The respondent is asked to indicate to what extent the statement applies to them, by circling a figure from 1 (this is not at all applicable) to 5 (this is extremely applicable). The statements themselves, in the English translation, vary in their implied time span, for example, “At times I wonder who I am exactly”, “I get into situations in which I do not want to be”, “It happens that I feel confused”, and “I have the feeling that my body is not (really) mine”, where the latter statement might be taken to

refer to the present. However, the high test-retest reliability coefficient (after 3-4 weeks, in a sample of 50 normal control subjects) does suggest that on the whole the respondents understood the questionnaire to refer to a phenomenon that was stable over time.

2.5.1.3.1.14 Stanford Acute Stress Reaction Questionnaire / “SASRQ” (Koopman et al., 1994; Freinkel et al., 1994)

2.5.1.3.1.14.1 Description

This is a self-report, Likert-type scale.

2.5.1.3.1.14.2 Origins of items

This questionnaire has developed through a few versions since its parent scale, the Checklist of Dissociative and Anxiety Phenomena / “CDAP” (Cardena & Spiegel, 1993) described above.

2.5.1.3.1.14.3 Subscales or symptom clusters

The version used by Koopman et al. (1994) contained 33 items that tapped 5 domains of dissociative symptoms: psychic numbing (4 items), depersonalisation (9 items), derealisation (9 items), amnesia (6 items), and stupor (5 items). It also contained 34 items assessing 5 domains of anxiety symptoms: intrusive thinking (11 items), somatic anxiety symptoms (17 items), hyperarousal (2 items), attention disturbance (3 items), and sleep disturbance (1 item). It also included symptoms of loss of personal autonomy.

The version used by Freinkel et al. (1994) contained 35 acute stress items assessing dissociation (17 items covering 7 kinds of dissociative symptoms: psychic numbing, stupor, derealisation, depersonalisation, detachment or estrangement from

others, amnesia, and flashbacks), anxiety (13 items covering intrusion, avoidance, and increased arousal symptoms), and 5 additional items (grief, despair, pain perception, avoiding activity, and other non-specified emotions).

#### **2.5.1.3.1.14.4 Grading of responses**

The Likert-type scale ranging from 0 (have not experienced) to 5 (very often experienced) gives an indication of the frequency of the symptoms.

#### **2.5.1.3.1.14.5 Population where scale tested**

Koopman et al. (1994) administered the 33-item version to 187 survivors of a firestorm. Freinkel et al. (1994) administered the version containing 35 acute stress items to 18 journalists who had witnessed an execution about a month before.

#### **2.5.1.3.1.14.6 Methods of validation**

The firestorm study's main aim was to examine the relative contributions of peritraumatic symptoms and stressors to post-traumatic stress symptoms, and only brief reference is made to unpublished results in 1991 of high internal consistency of the questionnaire and concurrent validity with the avoidance and intrusion subscales of the Impact of Event Scale. With regard to the 35-item version used by Freinkel et al. (1994), the 17 dissociative symptoms are said to have high internal consistency as found in the study with the firestorm survivors, but no results of such testing are presented.

#### **2.5.1.3.1.14.7 Time frame of the scale**

In the firestorm version, the period for the baseline assessment included the time during and immediately after the fire, and the follow-up assessment included the previous month. The journalists were asked to indicate the extent to which each of the



items described their experiences during and shortly after the execution, without specification of the exact period.

#### 2.5.1.3.1.14.8 Comment or evaluation

Although the period covered by these questionnaires was not exactly specified, and it was responded to in retrospect, up to 3 weeks later (in the first study) and about a month later (in the second study), it did highlight the occurrence of transient dissociative symptoms due to exposure to traumatic events.

#### 2.5.1.3.1.15 Peritraumatic Dissociation Experiences Questionnaire / PDEQ (Marmar et al., 1994)

##### 2.5.1.3.1.15.1 Description

The observer-rated version of this questionnaire is an 8-item, interviewer-based questionnaire.

##### 2.5.1.3.1.15.2 Origins of items

The items were drawn from clinical experience.

##### 2.5.1.3.1.15.3 Subscales or symptom clusters

It assesses retrospective reports of depersonalisation, derealisation, amnesia, out-of-body experience, and altered time perception.

##### 2.5.1.3.1.15.4 Grading of responses

Responses are rated on a Likert-type scale with the highest value assigned to “threshold” level of symptoms.

#### **2.5.1.3.1.15.5 Population where scale tested**

The questionnaire was tested in 251 male Vietnam veterans from the Clinical Examination Component of the (USA) National Vietnam Veterans Readjustment Study.

#### **2.5.1.3.1.15.6 Methods of validation**

Internal consistency was confirmed by a high Cronbach's alpha, and interpretation of the principal components factor analysis suggested that the total score represents peritraumatic dissociative experiences. Convergent validity was confirmed by its correlation with measures of traumatic stress response, level of war zone stress exposure, and the DES; discriminant validity was confirmed by its correlation with MMPI-2 clinical scales reflecting general psychopathology.

#### **2.5.1.3.1.15.7 Time frame of the scale**

Similar to the SASRQ described above, the PDEQ refers retrospectively to experiences the subject had while the traumatic combat event was occurring.

#### **2.5.1.3.1.15.8 Comment or evaluation**

Unlike the SASRQ, here the length of time that has elapsed since the event is not specified.

### **2.5.1.3.1.16 Phillips Dissociation Scale / PDS (Phillips, 1994)**

#### **2.5.1.3.1.16.1 Description**

This self-rating scale provides a measure of dissociation as part of a routine psychological evaluation, where a separate dissociation scale would not necessarily be administered.

#### **2.5.1.3.1.16.2 Origins of items**

Twenty items were extracted from the MMPI, MMPI-2, and MMPI-A (Hathaway & McKinley, 1970; Graham, 1993).

#### **2.5.1.3.1.16.3 Subscales or symptom clusters**

The items were not grouped into subscales.

#### **2.5.1.3.1.16.4 Grading of responses**

Responses are true/false.

#### **2.5.1.3.1.16.5 Population where scale tested**

It was tested in a sample of 20 patients with dissociative disorders and 20 patients with other diagnoses (a mixture of comorbid diagnoses of mood disorders, psychoactive substance use disorders, anxiety disorders, sexual disorders, eating disorders, and a few others; there were no patients with “purely” psychotic illness).

#### **2.5.1.3.1.16.6 Methods of validation**

Factor analytic strategies revealed 4 factors: amnesia / identity alteration; conversion symptoms; hearing voices; trance / depersonalisation. The results also showed good internal consistency and discriminant validity.

#### **2.5.1.3.1.16.7 Time frame of the scale**

It gives an indication of the lifetime prevalence of dissociative experiences.

#### **2.5.1.3.1.16.8 Comment or evaluation**

The fact that the dissociation questions are hidden among the other questions of the MMPI has the benefit of reducing the likelihood of manipulative responses. Another advantage of an MMPI-based scale is the availability of the lie scale, the defensiveness scale, the true response inconsistency scale, and the variable response inconsistency

scale. A limitation of this scale is that its validity and reliability only refer to data collected from a full MMPI administration, and there is no evidence to suggest that the PDS will produce the same results if given apart from the entire questionnaire.

#### **2.5.1.3.1.17 North Carolina Dissociation Index / NCDI (Mann, 1995)**

##### **2.5.1.3.1.17.1 Description**

This is a self-rating, true/false style, empirically derived scale.

##### **2.5.1.3.1.17.2 Origins of items**

It comprises items from the MMPI-2. Initially 65 items were identified, but after analysis 16 items were retained.

##### **2.5.1.3.1.17.3 Subscales or symptom clusters**

These items measure amnesia, depersonalisation, derealisation, behaviour or emotions not under conscious control, and identity confusion. Four of the items overlap with the Phillips Dissociation Scale described above.

##### **2.5.1.3.1.17.4 Grading of responses**

The true/false format does not allow for grading of responses.

##### **2.5.1.3.1.17.5 Population where scale tested**

The NCDI was tested in 525 college students. The study was replicated in a second sample of 431 college students. A study was also done in clinical populations (with dissociative disorders, anxiety disorders), gang combat veterans with or without PTSD, and normal controls.



#### 2.5.1.3.1.17.6 Methods of validation

In the first sample of 525 college students, point biserial correlation coefficients between factor scores of the Harvard Group Scale of Hypnotic Susceptibility Form A, and each of the original 65 items of the NCDI, were used to eliminate items, resulting in the retention of only those items where the association was statistically significant ( $p < 0.05$ ) (actual correlation coefficients not reported). The internal consistency of these remaining items was adequate, but the mean item-total correlation was only 0.36. In the second sample of 431 college students, the NCDI showed good convergent validity with the DES and the PAS, and a reasonable correlation with the SCID-D. The NCDI distinguished patients with dissociative disorders (N=7) from patients with anxiety disorders (N=15) and normal controls (N=23). The NCDI also distinguished between gang combat veterans with (N=14) or without (N=5) PTSD. A high test-retest reliability was reported.

#### 2.5.1.3.1.17.7 Time frame of the scale

It gives an indication of the lifetime prevalence of the experiences.

#### 2.5.1.3.1.17.8 Comment or evaluation

The high test-retest reliability of the NCDI confirms its use in measuring an enduring trait. The use of a measure of hypnotic susceptibility as a criterion against which to eliminate items from a dissociation scale casts a shadow over the construct validity of the NCDI. As for the PDS, the NCDI is intended primarily as a tool in settings where the MMPI-2 is routinely administered.

#### **2.5.1.3.1.18 Somatoform Dissociation Questionnaire / SDQ-20 (Nijenhuis et al., 1996)**

##### **2.5.1.3.1.18.1 Description**

This 20-item, self-rating, Likert-type questionnaire refers to somatoform dissociative experiences, and includes negative and positive dissociative phenomena. Somatoform dissociation is defined as “dissociative state-dependent somatoform responses that in clinical settings had appeared upon reactivation of particular dissociative states and that could not be medically explained”.

##### **2.5.1.3.1.18.2 Origins of items**

The items were drawn from clinical experience. The original pool of 77 items was submitted to 6 clinicians experienced in dealing with dissociative disorders, the result of which was the removal of 2 items.

##### **2.5.1.3.1.18.3 Subscales or symptom clusters**

The list contains several kinds of sensory losses, including analgesia and kinaesthetic anaesthesia, extending to vision and hearing. Other negative symptoms pertain to losses of motor control (inability to feel, swallow, speak, or move) and pseudo-epileptic seizures. Several items refer to positive dissociative symptoms, which apply to alterations of vision, hearing, taste, and smell, as well as to pain symptoms in the urogenital area and difficulty in urinating.

##### **2.5.1.3.1.18.4 Grading of responses**

Responses range from 1 (not applicable) to 5 (highly applicable) - discussed below under viii).

#### **2.5.1.3.1.18.5 Population where scale tested**

The scale was tested in 50 patients with dissociative disorders (according to SCID-D) and 50 patients with other DSM-IV diagnoses (29 with anxiety disorders, 5 with depressive disorders, 8 with eating disorders, and a few others - no psychotic illness).

#### **2.5.1.3.1.18.6 Methods of validation**

Logistic regression analyses were used to evaluate the ability of each item to discriminate between patients with dissociative disorders and other disorders, a discriminant index was calculated, and the 20 items with an index of 4.0 or higher were selected for further analysis. The 20 items were strongly scalable on a dimensional latent scale, were internally consistent, showed high convergent validity with the DIS-Q, and strongly distinguished between patients with dissociative and other disorders.

#### **2.5.1.3.1.18.7 Time frame of the scale**

There is doubt about the time-frame (see below under section 2.5.1.3.1.18.8), but it gives an indication of the lifetime prevalence of the experiences.

#### **2.5.1.3.1.18.8 Comment or evaluation**

As for the DIS-Q, a potential limitation of the SDQ-20 is that the wording is not very clear. All items are preceded by the words “It sometimes happens that.”, and then the scores range from 1 (not applicable) to 5 (highly applicable), leaving doubt as to whether the response should indicate the frequency of the experiences. However, the scale fills an important gap in the dissociation literature by providing psychometric evidence for the relationship between somatoform symptoms and dissociative symptoms.

### **2.5.1.3.2      *Measures of epilepsy***

#### **2.5.1.3.2.1      Bear-Fedio Personal Inventory and Personal Behavior Survey (Bear & Fedio, 1977)**

##### **2.5.1.3.2.1.1      Description**

These inventories originally contained 100 items, paired across the two inventories. The “Personal Inventory” was a self-report measure and the “Personal Behavior Survey” was a questionnaire to be completed by a long-term observer of the patient, e.g., a relative or partner.

##### **2.5.1.3.2.1.2      Origins of items**

The items were based on 18 behavioural traits that appeared to be associated with temporal lobe epilepsy. For each of the 18 traits, 5 items were included and 10 questions were added from the MMPI lie scale (Hathaway & McKinley, 1970). These questionnaires were later shortened to 37 items based on 14 behavioural traits, then called the Bear-Fedio Inventory (BFI).

##### **2.5.1.3.2.1.3      Subscales or symptom clusters**

Apart from the lie scale, the items covering the 18 (and later 14) behavioural traits were not subdivided into subscales or clusters.

##### **2.5.1.3.2.1.4      Grading of responses**

Each item has to be answered “yes” or “no”, so there is no grading of responses.

##### **2.5.1.3.2.1.5      Population where scale tested**

The BFI was tested in 15 patients with right temporal epileptic foci, 12 patients with left temporal epileptic foci, and 12 normal controls.



#### **2.5.1.3.2.1.6 Methods of validation**

On factor analysis, one general factor appeared in the temporal epileptic group. The self-report questionnaire correctly classified 90% of subjects to the epileptic and control groups, and rater observations correctly classified 92% of subjects to the epileptic and control groups.

#### **2.5.1.3.2.1.7 Time frame of the scale**

The inventory gives an indication of a longstanding tendency to certain behaviours interictally associated with temporal lobe epilepsy, yet does not evaluate more rapidly changing experiences, inclusive of dissociative experiences.

#### **2.5.1.3.2.1.8 Comment or evaluation**

Two of the traits, “emotionality” (including intense moods) and “religiosity” (including reference to mystical states), showed overlap with dissociative symptoms as exemplified in previous scales of dissociation.

### **2.5.1.3.2.2 Personal Philosophy Inventory / PPI (Persinger & Makarec, 1987; Makarec & Persinger, 1990)**

#### **2.5.1.3.2.2.1 Description**

This inventory is composed of 140 items to which true/false responses are given.

#### **2.5.1.3.2.2.2 Origins of items**

The lie scale items originated from the MMPI (Hathaway & McKinley, 1970) and the others were drawn mainly from clinical experience.

#### **2.5.1.3.2.2.3 Subscales or symptom clusters**

In addition to a variety of control statements (16 mundane cognitive and proprioceptive experiences), 20 information statements (e.g., hand preference, church

attendance), and lie scale items, it also contains 30 items concerned with beliefs (including exotic fantasies and religious opinions), 30 items concerning major, general temporal lobe signs / TLS cluster, and 16 items forming a minor complex partial epileptic (ictal) signs / CPES cluster. There are also items on “sense of presence”, “paranormal experiences”, and “hyperwriting”.

#### **2.5.1.3.2.2.4 Grading of responses**

The true/false format does not allow for grading of responses.

#### **2.5.1.3.2.2.5 Population where scale tested**

The inventory was designed to test the presence of the weaker analogues of complex partial epilepsy signs within the normal population. It was also administered to special normal populations (poets, drama students, and women with false pregnancies) and to clinical groups (post-traumatic stress, anxiety-depersonalisation, exotic dissociations, and complex partial epilepsy) (Persinger & Macarec, 1993). The inventory was also validated electro-encephalographically in 61 university students.

#### **2.5.1.3.2.2.6 Methods of validation**

In the normal population sample, CPES scores were significantly correlated with the schizophrenia and mania subscales of the MMPI, and the internal consistency of the symptom clusters was demonstrated. Also, temporal lobe and paranormal symptoms constituted one factor on factor analysis, which was distinguishable from the control cluster symptoms. Normative data were presented for the special normal populations and for the clinical groups mentioned above; the clinical groups showed more temporal lobe signs. In the university students a correlation was found between total symptom score and alpha activity in the temporal lobes.

#### **2.5.1.3.2.2.7 Time frame of the scale**

The PPI gives an indication of the lifetime prevalence of the experiences.

#### **2.5.1.3.2.2.8 Comment or evaluation**

A few items showed overlap with the dissociation scales as indicated in Table 3.2 (Chapter 3). Although the inventory measures phenomena accompanying electroencephalographic alpha activity that is by definition variable, the PPI only gives an indication of the lifetime prevalence of the experiences, and does not measure subjective experiences concurrently with EEG correlates.

#### **2.5.1.3.2.3 Structured Clinical Interview for Complex Partial Seizure-Like Symptoms / SCI-CPSLS (Roberts et al., 1990)**

##### **2.5.1.3.2.3.1 Description**

This includes 36 items representing complaints associated with complex partial seizures. “Total Symptom Score” (summing the numerical response score for each item) and “Total Symptom Count” (summing the number of items on which an individual subject exceeded the 95th percentile cutoff score for the low risk sample) are calculated.

##### **2.5.1.3.2.3.2 Origins of items**

Selection of items was guided largely by Hughlings Jackson’s description of temporal lobe seizure symptoms and by symptoms enumerated by the International League Against Epilepsy that are used to classify partial seizure disorders.

##### **2.5.1.3.2.3.3 Subscales or symptom clusters**

The items are not grouped into subscales.

#### **2.5.1.3.2.3.4 Grading of responses**

Items are responded to on a 5-point scale of frequency.

#### **2.5.1.3.2.3.5 Population where scale tested**

The interview was administered to 2 samples of 661 and 435 undergraduate psychology students, and to 15 male neuropsychiatric patients.

#### **2.5.1.3.2.3.6 Methods of validation**

Test-retest reliability was demonstrated, and normative data were presented for people with a low or a high risk of potential cerebral dysfunction.

#### **2.5.1.3.2.3.7 Time frame of the scale**

The period covered is the previous year.

#### **2.5.1.3.2.3.8 Comment or evaluation**

A few of these items showed overlap with dissociative symptoms as detailed in Table 3.2 (Chapter 3).

### **2.5.1.3.3 *Measures of general psychopathology***

#### **2.5.1.3.3.1 Present State Examination / PSE (Wing et al., 1974)**

##### **2.5.1.3.3.1.1 Description**

This is a 140-item, structured diagnostic clinical interview schedule, where the presence of symptoms is noted on Likert-type scales, with a variable number of possible responses.

##### **2.5.1.3.3.1.2 Origins of items**

The schedule evolved through 9 editions, drawing also on clinical experience.



#### 2.5.1.3.3.1.3 Subscales or symptom clusters

From the individual items, 38 possible syndromes are derived, including a “hysteria” syndrome (number 10), consisting of dissociative hallucinations, dissociative states, conversion symptoms, and histrionic behaviour. Another syndrome, called a depersonalisation syndrome (number 23), consists of derealisation and depersonalisation symptoms. The syndrome profiles of patients are plotted and syndromes are also grouped into CATEGO classes, named after the computer program used to process the data.

#### 2.5.1.3.3.1.4 Grading of responses

Responses indicate whether symptoms have been absent or present to a moderate or a severe degree.

#### 2.5.1.3.3.1.5 Population where scale tested

The PSE was used in 2 large-scale international projects: the US-UK Diagnostic Project (1972) where a total of 866 patients with a variety of psychiatric diagnoses participated, and the World Health Organisation International Pilot Study of Schizophrenia (1973) where 1202 patients with functional psychoses participated at 9 field centres.

#### 2.5.1.3.3.1.6 Methods of validation

Raters were trained in the use of the PSE. Reliability was tested in 2 ways: first, by comparing several clinicians rating the same interview, and second, by comparing different interviewers rating the same patient after a few days (the second way also called repeatability). Kappa statistics fell from a mean value of 0.77 for all items in an inter-observer study, to 0.41 in a repeatability study. For section scores, Kappa statistics fell from a mean of 0.84 in an inter-observer study on 190 interviews rated

by 2 psychiatrists, to 0.64 in a repeatability study on 51 patients. These figures were taken to be acceptable. The reliability of items also varied according to the symptom, e.g., the reliability was higher for depressive symptoms, but lower for anxiety symptoms.

The 9th version of the PSE was also based on factor analysis of data collected during previous versions.

#### 2.5.1.3.3.1.7 Time frame of the scale

Symptoms during the past month are addressed. Attempts by the authors to use a time frame of 1 week and even a pure state measure, are said to have failed.

#### 2.5.1.3.3.1.8 Comment or evaluation

The subject's behaviour, affect, and speech are also examined during the interview.

#### 2.5.1.3.3.2 Symptom Checklist-90-R / SCL-90-R (Derogatis, 1975/1993; Derogatis & Lazarus, 1994)

##### 2.5.1.3.3.2.1 Description

This self-report symptom inventory contains 90 items assessing psychological distress in terms of nine primary symptom dimensions and three global indices of distress.

##### 2.5.1.3.3.2.2 Origins of items

The SCL-90-R evolved most immediately from the Hopkins Symptom Checklist (HSCL) by the same first author.

##### 2.5.1.3.3.2.3 Subscales or symptom clusters

The 9 primary symptom dimensions represent the constructs of somatisation, obsessive-compulsive, interpersonal sensitivity, depression, anxiety, hostility, phobic anxiety, paranoid ideation, and psychoticism. Three global measures, the Global

Severity Index (GSI), the Positive Symptom Distress Index (PSDI), and the Positive Symptom Total (PST), complete the complement of measures.

#### 2.5.1.3.3.2.4 Grading of responses

Respondents are requested to indicate on a 5-point Likert-type scale how much a symptom has distressed or bothered them.

#### 2.5.1.3.3.2.5 Population where scale tested

The SCL-90-R has been tested in 1002 psychiatric outpatients, 973 community nonpatients, 423 psychiatric inpatients, and 806 adolescent nonpatients.

#### 2.5.1.3.3.2.6 Methods of validation

Internal consistency coefficients (coefficients alpha) for the nine dimensions have been calculated from the data of 209 symptomatic volunteers and 103 outpatients presenting for psychotherapy. The coefficients ranged from a low of 0.77 for psychoticism to a high of 0.90 for depression in the first sample, and from a low of 0.84 for interpersonal sensitivity to a high of 0.90 for depression in the second sample.

Test-retest reliability coefficients have also been calculated from the data of 2 samples: from 94 heterogeneous psychiatric outpatients (over a period of 1 week) and from the same 103 outpatients referred to above (over a period of 10 weeks). The coefficients ranged from a low of 0.78 on hostility to a high of 0.90 on the phobic anxiety dimension in the first sample, and from a low of 0.70 for obsessive-compulsive to a high of 0.83 for paranoid ideation in the second sample. (Also see under viii) - Comment or evaluation - below.)

Good convergent-discriminant validity for the SCL-90-R has been demonstrated in a study contrasting its dimensions with those of the Minnesota Multiphasic Personality Inventory (MMPI). The SCL-90-R dimensions had their

highest correlations with like MMPI constructs in every case except obsessive-compulsive, which has no directly comparable MMPI scale.

Data from the SCL-90-Rs of 1 002 psychiatric outpatients were factor analysed and the solution rotated in two ways; both solutions matched the hypothesised dimensional structure of the SCL-90-R cleanly, with only the psychoticism dimension showing some scatter. All dimensions revealed acceptable levels of factorial invariance between males and females, with the exception of paranoid ideation, which showed only moderate constancy.

Concurrent validation using the PSE (and on dimensional level using the BDI) also yielded statistically significant correlation coefficients.

The predictive validity of the SCL-90-R has been demonstrated repeatedly in numerous published research reports using the SCL-90-R.

#### 2.5.1.3.3.2.7 Time frame of the scale

The enquiry is into the previous 7 days including the day of completion of the checklist.

#### 2.5.1.3.3.2.8 Comment or evaluation

The high test-retest reliability coefficients referred to above actually detract from its utility in outcome assessment studies, where the authors see a role for the SCL-90-R.

As indicated in Table 3.2 (Chapter 3), a number of dissociative symptoms are interspersed among the 90 items, although they were not identified as a separate primary symptom dimension. Some of these symptoms fall under the symptom dimension of somatisation.



#### **2.5.1.3.4      *Measures of psychosis***

##### **2.5.1.3.4.1      Scale for the assessment of negative symptoms / SANS (Andreasen, 1982, 1989)**

###### **2.5.1.3.4.1.1      Description**

This is a 24-item, interviewer-based, Likert-type scale. In addition to individual item scores and global severity ratings for each symptom complex, a summary score and a composite score are also calculated.

###### **2.5.1.3.4.1.2      Origins of items**

Five global measures or symptom complexes (see next paragraph) were chosen empirically, based on clinical experience.

###### **2.5.1.3.4.1.3      Subscales or symptom clusters**

It assesses the negative symptoms of affective flattening or blunting, alogia, avolition-apathy, anhedonia-asociality, and attentional impairment.

###### **2.5.1.3.4.1.4      Grading of responses**

The 6-point Likert scale allows for varying severity of symptoms, from “not at all” to “severe”.

###### **2.5.1.3.4.1.5      Population where scale tested**

Although tested mainly in patients with schizophrenia, it was not designed exclusively for use in patients with schizophrenia and this is reflected in the sensitivity of the scale in picking up relatively mild symptoms.

#### **2.5.1.3.4.1.6 Methods of validation**

Good inter-rater reliability and good internal consistency (by Cronbach's alpha) are reported (in 150 patients). A kind of clinical validation was carried out in 52 patients with DSM-III schizophrenia, where the sociodemographic characteristics were found to differ among subgroups with negative, positive, and mixed schizophrenia. A principal components analysis of positive and negative symptoms in these same patients suggested that the negative symptoms represented a unitary dimension.

#### **2.5.1.3.4.1.7 Time frame of the scale**

The expectation is that investigators will use a time-set of 1 month.

#### **2.5.1.3.4.1.8 Comment or evaluation**

Negative symptoms with particular relevance to dissociation come from 2 dimensions (with the corresponding dissociative symptom in brackets): avolition-apathy as evidenced by physical anergia (feeling immobile like a statue, while being aware of what is going on around oneself) and attentional impairment as evidenced by social inattentiveness (being unaware of what is happening around oneself).

### **2.5.1.3.4.2 Scale for the assessment of positive symptoms / SAPS (Andreasen, 1984)**

#### **2.5.1.3.4.2.1 Description**

This 34-item, interviewer-based, Likert-type scale was designed to assess positive symptoms, principally those that occur in schizophrenia. In addition to individual item scores and global severity ratings for each symptom complex, a summary score and a composite score are also calculated.

#### **2.5.1.3.4.2.2 Origins of items**

The symptom complexes were chosen empirically, based on clinical experience.

#### **2.5.1.3.4.2.3 Subscales or symptom clusters**

The symptoms include hallucinations, delusions, bizarre behaviour, and positive formal thought disorder. Originally, catatonic motor behaviour was included in the list of symptom complexes, but because it was subsequently found to be extremely rare, it was dropped from later versions of the SAPS.

#### **2.5.1.3.4.2.4 Grading of responses**

The 6-point Likert scale allows for varying severity of symptoms, from “none” to “severe”.

#### **2.5.1.3.4.2.5 Population where scale tested**

Although tested mainly in patients with schizophrenia, it was not designed exclusively for use in patients with schizophrenia and this is reflected in the sensitivity of the scale in picking up relatively mild symptoms.

#### **2.5.1.3.4.2.6 Methods of validation**

The construct validity of this group of positive symptoms has been questioned, and further factor analyses have demonstrated that positive symptoms subdivide into psychotic and disorganised dimensions (Arndt et al., 1991; Klimidis et al., 1993; Andreasen et al., 1995). The latter study was done on data from 229 patients with schizophrenia and 14 with schizophreniform disorder.

#### **2.5.1.3.4.2.7 Time frame of the scale**

The expectation is that investigators will use a time-set of 1 month.

#### **2.5.1.3.4.2.8 Comment or evaluation**

Positive symptoms with particular relevance to dissociation come from more than one dimension (with the corresponding dissociative symptom in brackets): delusions of thought insertion (the idea that a person's thoughts are not all their own), delusions of being controlled (feeling possessed or controlled by something or someone), auditory hallucinations of voices commenting (inner voices) or conversing (a dialogue in the person's head), somatic or tactile hallucinations (the sensation that parts of a person's body has changed in shape or size), and positive formal thought disorder as evidenced by distractible speech (a person forgetting what they want to do or say).

#### **2.5.1.3.4.3 Positive and Negative Syndrome Scale / PANSS (Kay et al., 1986/1992, 1987, 1989) and Structured Clinical Interview for the Positive and Negative Syndrome Scale / SCI-PANSS (Kay, 1991; Opler et al., 1992)**

##### **2.5.1.3.4.3.1 Description**

The PANSS is a 30-item (or 33-item), 7-point (Likert-type) rating instrument.

##### **2.5.1.3.4.3.2 Origins of items**

It contains 18 adapted items from the Brief Psychiatric Rating Scale / BPRS (Overall & Gorham, 1962) and 12 adapted items from the Psychopathology Rating Schedule / PRS (Singh & Kay, 1975).

##### **2.5.1.3.4.3.3 Subscales or symptom clusters**

The positive scale contains 7 items: delusions, conceptual disorganisation, hallucinatory behaviour, excitement, grandiosity, suspiciousness / persecution, and hostility. The negative scale also contains 7 items: blunted affect, emotional withdrawal, poor rapport, passive / apathetic withdrawal, difficulty in abstract



thinking, lack of spontaneity and flow of conversation, and stereotyped thinking. The general psychopathology scale contains 16 items, including items pertaining to depression and anxiety. The 33-item version includes 3 items for supplemental aggression risk.

#### **2.5.1.3.4.3.4 Grading of responses**

Detailed rating guidelines describe and provide examples for 7 levels of symptom severity.

#### **2.5.1.3.4.3.5 Population where scale tested**

The PANSS was tested in a normative sample of 240 patients with DSM-III schizophrenia. Although originally designed for use in patients with schizophrenia, it has also been used with families of patients with schizophrenia (Bassett et al., 1994).

#### **2.5.1.3.4.3.6 Methods of validation**

Psychometric testing of the PANSS has shown good inter-rater reliability, internal consistency, split-half reliability, concurrent validity in relation to the SAPS and SANS, and discriminant validity from other cognitive and affective measures (Kay et al., 1986/1992, 1987, 1989; Peralta & Cuesta, 1994; Von Knorring & Lindström, 1992, 1995; Lindström et al., 1994). Factor analyses of PANSS ratings of patients with schizophrenia have indicated the presence of dimensions beyond the original positive / negative / general psychopathology subscales and, in particular, a 5-factor model has been suggested consisting of negative, positive, cognitive, excitement, and depression / anxiety components (Kay et al., 1986/1992, Lindenmayer et al., 1994; Von Knorring & Lindström, 1995).

#### 2.5.1.3.4.3.7 Time frame of the scale

The questions in the structured interview refer to the patient's experiences during the preceding week. Psychopharmacological research has supported the drug sensitivity of the PANSS when used longitudinally in 10 neuroleptic refractory inpatients with schizophrenia (Kay et al., 1986/1992).

#### 2.5.1.3.4.3.8 Comment or evaluation

The structured clinical interview was developed to optimise the objectivity and standardisation of the scale by generating a productive flow of conversation while systematically eliciting information on various realms of psychopathology (Kay, 1991). The interview also lends itself to observation of physical manifestations of affect and psychomotor behaviour, interpersonal behaviour, cognitive-verbal processes inclusive of formal thought disorder, thought content, and response to structured questioning on mental state.

The overlap that the SAPS and SANS have with dissociative symptoms is not evident to the same degree in the PANSS. The PANSS does not address passivity phenomena directly. Although there is overlap in the original PANSS positive subscale, the original PANSS negative subscale shows no overlap; rather, the general psychopathology subscale shows the most overlap with conversion-type and amnesia-type dissociative symptoms (detailed in Table 3.2, Chapter 3). In the 5-factor model described above, the greatest overlap with dissociative symptoms is in the cognitive component, with some overlap in the positive component also.

### 2.5.2 *What do the different scales of dissociation measure?*

The existing scales of dissociation share certain characteristics, but their groups of symptoms or experiences overlap only to a limited extent.

### **2.5.2.1 Shared characteristics of measures of dissociation**

Some existing measures of dissociation treat dissociation like a personality trait, whereas others consider it psychopathology. However, this distinction is not always clear for all measures of dissociation. These different treatments of dissociation reflect their different times of development.

#### **2.5.2.1.1 *Dissociation as personality trait versus psychopathology***

The different treatments of dissociation, i.e. as personality trait or as psychopathology, may be linked to the different populations for which the measures of dissociation were developed. Some were developed for use among ill patients, whereas others were developed from personality inventories (not necessarily linked to illness).

##### **2.5.2.1.1.1 Measures of personality**

As indicated in Chapter 1 (section 1.3), there has been a school of thought that considers dissociation a kind of personality trait, and this has led to items relating to dissociation finding their way into personality inventories. In recognition of this, subscales have been derived from personality measures, in order to capture those dissociative tendencies that some people have. The Phillips Dissociation Scale / PDS (section 2.5.1.3.1.16) and the North Carolina Dissociation Index / NCDI (section 2.5.1.3.1.17) are such examples – both comprise items from the Minnesota Multiphasic Personality Inventory / MMPI.

##### **2.5.2.1.1.2 Measures of pathological dissociation**

Some of the measures of dissociation assess the presence (and rarely also the severity) of dissociative symptoms during an unspecified or specified period, whereas others

elicit a retrospective account of dissociative experiences during a specified period in the (sometimes distant) past. In both cases the underlying assumption is that the dissociative symptoms represent a change from a previous state, and that the symptoms are pathological. Some of these are self-rating and some are clinician-administered questionnaires, and they can be divided into two groups according to their purpose:

#### 2.5.2.1.1.2.1 Diagnostic measures

The Structured Clinical Interview for DSM-IV Dissociative Disorders / SCID-D (section 2.5.1.3.1.7) is an example of such a measure where the purpose is the diagnosis of dissociative disorders.

#### 2.5.2.1.1.2.2 Clinical assessment measures

Other measures of pathological dissociation are used in research, e.g., on the effects of exposure to traumatic events, without necessarily aiming at diagnosis. The Stanford Acute Stress Reaction Questionnaire / SASRQ (section 2.5.1.3.1.14) is an example.

#### 2.5.2.1.1.3 Unclear combination of dissociative personality traits and pathological dissociation

The Dissociative Experiences Scale / DES (section 2.5.1.3.1.2) represents an example of confusion between the stated purpose of a scale, the domain it appears to cover on inspection, and its application. The widely used DES was designed for use in clinical populations, in order to screen for (pathological) dissociation, yet the underlying assumption is that the capacity for dissociation is an enduring feature, something similar to a (non-pathological) personality trait.<sup>3</sup> The application of the DES in studies

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<sup>3</sup> On the basis of the latter observation of its focus on dissociative tendencies, the DES was grouped with the other 'measures of personality' in Figure 2.1 and Table 2.2.



to measure change or improvement of ‘dissociation’ after treatment (Dubester et al., 1995), amounts to misuse of the scale, since it really measures an enduring tendency to dissociate.

#### **2.5.2.1.2      *Different times of development***

The different treatments of dissociation by the scales, i.e. as personality trait versus psychopathology, reflect their different historic times of development. Figure 2.1<sup>4</sup> illustrates the development of scales containing dissociation items from various domains, during the last 25 years.<sup>5</sup> It shows that the measures of personality that contain dissociation items (those are the Dissociative Experiences Scale / DES, the Perceptual Alteration Scale / PAS, the Questionnaire of Experiences of Dissociation / QED, the Phillips Dissociation Scale / PDS, and the North Carolina Dissociation Index / NCDI) were developed during the late 1980s and again during the middle 1990s (see dates of publication in Table 2.1). Figure 2.1 also illustrates the relative surge of measures of pathological dissociation during the last decade.

#### **2.5.2.2 Some scales share little content**

The existing scales mostly measure amnesia, depersonalisation, derealisation, and some other forms of altered perception; some of them focus on symptoms of identity alteration or on sexual behaviour; several also include affective, anxiety, somatoform, and positive (psychotic) symptoms. There is a tendency for the more recent scales to include conversion / somatoform symptoms.

On the whole, scales of dissociation measure different sets from a pool of (so-called) dissociative experiences, but subsequently some scales share little content.

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<sup>4</sup> Figures and tables are presented at the end of the relevant chapter.

However, most of them measure alteration of identity and alteration of cognitive functioning as exemplified by amnesia and, to a lesser extent, depersonalisation. No single scale can therefore be taken to represent a consensus view of the core of dissociation.

### **2.5.2.3 Inadequate grading of responses**

A shortfall observed was that the majority of the existing scales do not measure the severity or intensity of dissociative symptoms. Partly responsible for the inadequate grading is the fact that most of the scales are trait scales, so that the scale refers to several or numerous possible instances of dissociation of varying degrees in the past, so that the scale cannot meaningfully rate the average severity of the symptoms. But even the scales with a shorter time frame often do not allow for a severity rating. The only scales that allow for the grading of the severity (not the frequency) are the 'HSCL-D', and the SCID-D.

### ***2.5.3 Assessment of existing scales for their suitability to measure dissociative states at the time that these states occur***

The time frames of the measures of dissociation have been summarised already (section 2.5.1.3). Table 2.2 compares the various time frames used in the existing measures of dissociation. (The abbreviations used are the same as used above and set out in the list of abbreviations at the beginning of the thesis.) Most of the scales of dissociative experiences measure the lifetime prevalence of, or the usual frequency of dissociative experiences.

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<sup>5</sup> One of the scales, the Depersonalisation Inventory (Dixon, 1963) was omitted from the figure because its separateness in time would have resulted in a smaller, less user-friendly scale to the figure.

The third row in Table 2.2 shows that some of the more recent measures of pathological dissociation make use of a shorter time frame that varies from 6 months to one week. These scales with shorter time frames were constructed during the last 7 years, along with more scales that measure a long-standing tendency to dissociation.

However, the time frames of the existing scales are not brief enough. None of the scales is sensitive to momentary (on-off) alterations or the short-term variability in the intensity and duration of dissociative symptoms, despite clinical suggestions of rapid switches in and out of or between dissociative states (APA, 1994; Putnam, 1989; Loewenstein, 1991; Beere, 1996; Ryle, 1997).

The nearest the existing scales come to approximate a state scale, is by specifying a time frame of a week (HSCL-D, CDAP), or retrospective reports of experiences during or shortly after an event (SASRQ), or retrospective reports of experiences during an event (PDEQ).

Nevertheless, none of these scales can measure dissociative states at the time they occur, even though there is sufficient evidence of state characteristics of dissociation as made clear in chapter 1. The implication is that none of these scales can be used to study concurrent neurophysiological correlates of dissociation.

#### *2.5.4 Assessment of psychometric validation of the measures of dissociation*

The existing measures were not all psychometrically validated in the same way or to the same extent, as has been seen in section 2.5.1.3. The authors of the scales refer to results of, e.g., Cronbach's alpha, test-retest reliability, and factor analyses. However, few made use of external or internal criterion-related validity testing, and those who did, used tangentially related concepts such as hypnosis as an external criterion. In a

few cases good use was made of discriminant validity testing, but some scales, on the other hand, do not appear to have been subject to psychometric validation.

In summary, the psychometric testing of the existing measures of dissociation consisted of widely varying amounts of reliability testing (internal consistency and test-retest reliability) and some construct validity (internal factor analysis and discriminant validity); but little testing of criterion-related validity.

Reasons for the virtual absence of criterion-related validity testing might be that first, there has been no consensus about what constitutes dissociation, and consequently about what could serve as an external criterion in the testing of external criterion-related validity,<sup>6</sup> and second, external criterion-related validity testing requires the laborious contrasting of samples of patients with the concomitant use of additional scales to measure the presence of the contrasting phenomena. These research demands might impede the testing of external criterion-related validity.

However, the different ways in which the scales have been validated, do not *per se* discredit the scales, since there are various appropriate ways to validate a scale psychometrically (discussed in Chapter 3).

## ***2.6 Conclusions and implications for the development of the SSD***

The existing measures of dissociation were described following a systematic literature review. The lack of a suitable measure of dissociative states, at the time that these states occur, was demonstrated. This lack warrants the development of a state scale of dissociation (Chapters 4-7) that would be sensitive to momentary alterations or the short-term variability in the duration as well as in the intensity of dissociative

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<sup>6</sup> Chapter 3 will detail the procedure for the testing of, i.a., external criterion-related validity.



symptoms. This would allow for the study of concurrent electroencephalographic correlates to dissociative states (Chapters 8-10).

The examination of existing measures of dissociation revealed measurement of different *aspects* of dissociation, for example, personality trait-like aspects and more pathological aspects (state-like or trait-like) which will inform the content of the State Scale of Dissociation (SSD) in its development (Chapter 4).

Furthermore, the examination of existing measures of dissociation showed that they have been validated in various ways and to varying degrees. The thoroughly validated measures set good examples for the proper validation of the SSD. Their methods of validation should be considered in the validation of the SSD, and therefore they will be examined in the next chapter, as part of the methodology of validation and reliability testing of psychiatric scales in general (Chapter 3).

**Table 2.1** Comparison of existing measures of dissociation (a)

Title		Author	Type	Items	Symptom clusters
1	Depersonalisation Inventory / DPI	Dixon (1963)	Self-rating, Likert	43	Depersonalisation
2	Dissociative Experiences Scale / DES	Bernstein & Putnam (1986)	Self-report, visual analogue	28	Amnesia, depersonalisation, derealisation, absorption, imaginative involvement
3	Perceptual Alteration Scale / PAS	Sanders (1986)	Self-rating, Likert-type	60	Modification of affect, control, and cognition
4	Questionnaire of Experiences of Dissociation / QED	Riley (1988)	Self-rating, true/false	26	Amnesia, depersonalisation, derealisation, identity alteration, detachment, trance, imagination.
5	Dissociative Disorders Interview Schedule / DDIS	Ross <i>et al</i> (1989)	Structured, interviewer-based	131	History, childhood abuse, substances, somatic, first rank, and supernatural symptoms, depression, BPD, MPD, trances, amnesia, fugue, depersonalisation, and others
6	Dissociation Scale for Symptom Checklist (SCL-90) and Hopkins Symptom Checklist (HSCL) / HSCL-D	Briere & Runtz (1990)	Self-rating, Likert-type	13	The items were not grouped into subscales

**Table 2.1** Comparison of existing measures of dissociation (b)

Title	Author	Type	Items	Symptom clusters
7 Structured Clinical Interview for DSM-IV Dissociative Disorders / SCID-D	Steinberg <i>et al</i> (1990, 1993, 1994)	Semi-structured, interviewer-based	277	Amnesia, depersonalisation, derealisation, identity confusion, identity alteration; includes severity ratings
8 Trauma Symptom Inventory / TSI	Briere (1991, 1992, 1995)	Self-report, Likert-type	100	Anxious arousal, depression, anger/irritability, intrusive experiences, avoidance, dissociation, sexual concerns and behaviour, self-reference, tension reduction, 3 validity scales
9 Office Mental State Examination / OMSE	Loewenstein (1991)	Semi-structured, interviewer-led	39	Process MPD, amnesia, autohypnotic, PTSD, somatoform, affective symptoms
10 Trauma Symptom Checklist-40 / TSC-40	Elliot & Briere (1992)	Self-report, Likert-type	40	Anxiety, depression, dissociation, sexual abuse trauma index, sexual problems, sleep disturbance
11 Checklist of dissociative and anxiety phenomena / CDAP	Cardaña & Spiegel (1993)	Self-report, Likert-type	98	Alteration in perception, cognition, and memory, somatic and non-somatic anxiety, derealisation and avoidance, depersonalisation, Schneiderian first-rank symptoms
12 Kelley-Kodman Self-report Questionnaire of Dissociation and Multiple Personality / KKDMP	Cooper (1993)	Self-report, Likert-type	94	Memory, mood, physical symptoms, voices, perceptual disturbances, significant others feedback, abuse history, loss of executive control, imagination, behaviours

**Table 2.1** Comparison of existing measures of dissociation (c)

Title	Author	Type	Items	Symptom clusters
13 Dissociation Questionnaire / DIS-Q	Vanderlinden <i>et al</i> (1993)	Self-report, Likert-type	63	Identity confusion; loss of control over behaviour, thoughts, and emotions; amnesia; absorption
14 Stanford Acute Stress Reaction Questionnaire / SASRQ	Koopman <i>et al</i> (1994); Freinkel <i>et al</i> (1994)	Self-report, Likert-type	35	Psychic numbing, stupor, derealisation, depersonalisation, detachment/estrangement, amnesia, flashbacks
15 Peritraumatic Dissociation Experiences Questionnaire / PDEQ	Marmar <i>et al</i> (1994)	Interviewer-based	8	Depersonalisation, derealisation, amnesia, out of body experiences, altered time perception
16 Phillips Dissociation Scale / PDS of the MMPI	Phillips (1994)	Self-rating, true/false	20	Amnesia/identity alteration, conversion symptoms, hearing voices, trance/depersonalisation
17 North Carolina Dissociation Index / NCDI (from MMPI-2)	Mann (1995)	Self-rating, true/false	16	Amnesia, depersonalisation, derealisation, behaviour / emotions not under conscious control, identity confusion
18 Somatoform Dissociation Questionnaire / SDQ-20	Nijenhuis <i>et al</i> (1996)	Self-report, Likert-type	20	Alterations in or inability to feel, swallow, taste, smell, speak, see, hear, or move; pain symptoms

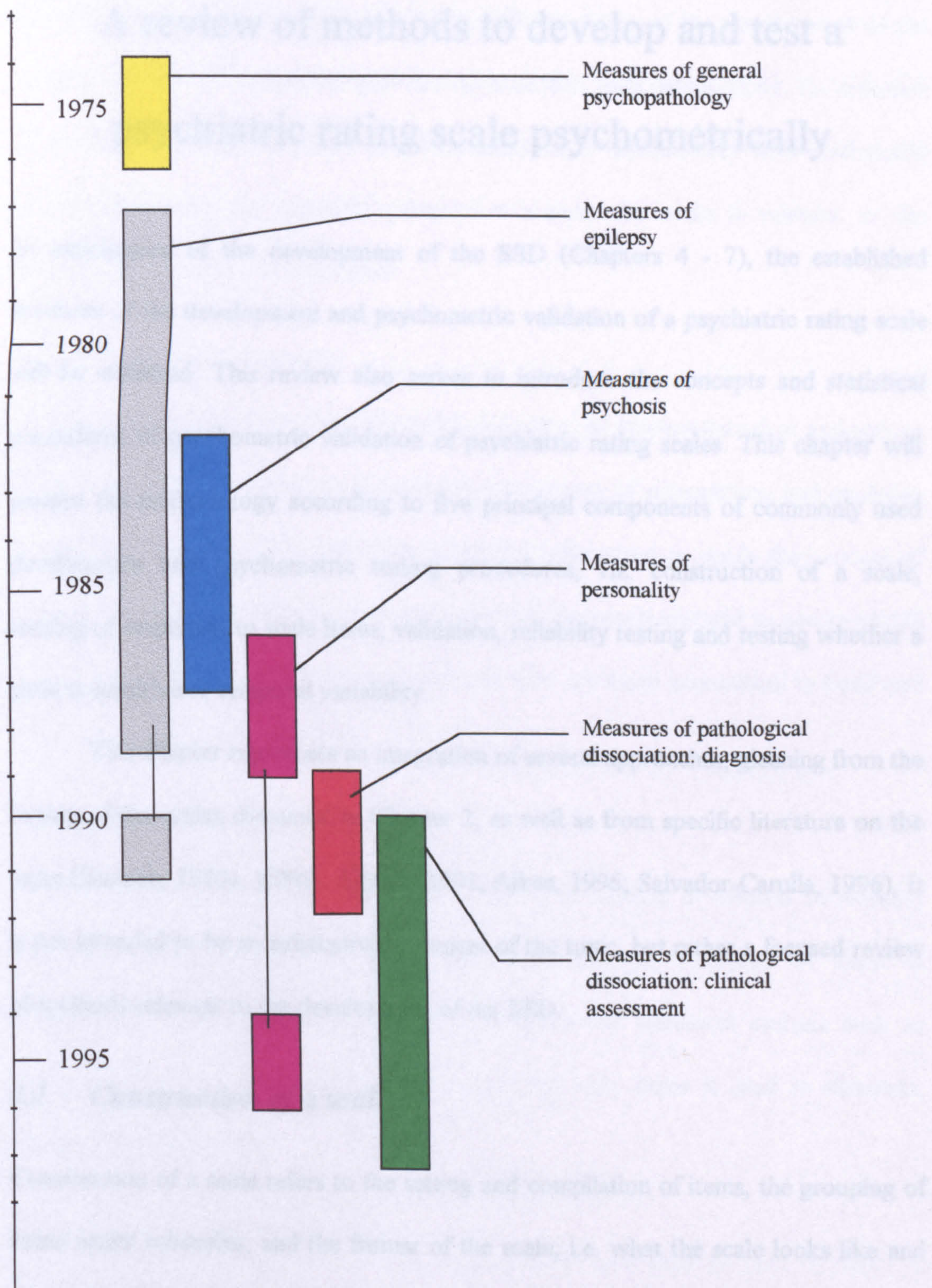


**Table 2.2** Time-frames of existing scales of dissociation

<i>Field of study</i>	<i>Usual tendency</i>	<i>1 year</i>	<i>6 months</i>	<i>2 months</i>	<i>1 month</i>	<i>1 week</i>	<i>Right now</i>
Measures of personality	DES						
	PAS						
	QED						
	PDS						
	NCDI						
Measures of pathological dissociation: diagnosis	DDIS						
	SCID-D						
	OMSE						
Measures of pathological dissociation: clinical assessment	KKDMP	DPI	TSI	TSC-40	SASRQ	HSCL-D	SSD
	DIS-Q					CDAP	
	SDQ					PDEQ	
Measures of epilepsy	BFI	SCI-CPSLS					
	PPI						
Measures of general psychopathology					PSE	SCL-90-R	
Measures of psychosis					SANS	PANSS	
					SAPS		



**Figure 2.1** Existing scales containing dissociative experiences:  
development over time





## A review of methods to develop and test a psychiatric rating scale psychometrically

In anticipation of the development of the SSD (Chapters 4 - 7), the established methods of the development and psychometric validation of a psychiatric rating scale will be reviewed. This review also serves to introduce the concepts and statistical procedures of psychometric validation of psychiatric rating scales. This chapter will present the methodology according to five principal components of commonly used development and psychometric testing procedures, viz. construction of a scale, scoring of responses to scale items, validation, reliability testing and testing whether a scale is sensitive to temporal variability.

This chapter represents an integration of several approaches, gleaned from the testing of the scales discussed in Chapter 2, as well as from specific literature on the topic (Burisch, 1984a, 1984b; Altman, 1991; Aiken, 1996; Salvador-Carulla, 1996). It is not intended to be an exhaustive treatment of the topic, but rather a focused review of methods relevant to the development of the SSD.

### ***3.1 Construction of a scale***

Construction of a scale refers to the setting and compilation of items, the grouping of items under subscales, and the format of the scale, i.e. what the scale looks like and how it should be completed.

### ***3.1.1 Various approaches to the construction of a scale***

The process of construction of a scale is multi-perspectival; in other words, several perspectives may aid the process, often at different stages of the development of the scale. A theoretical perspective prevents idiosyncratic scale development. An itemetric perspective ensures the scale is constructed in a scientifically and statistically accountable way. An empirical perspective ensures the scale is relevant to the populations for whom it is designed.

#### **3.1.1.1 Theoretical approach**

The theoretical approach, also called the deductive or content-based or rational or intuitive approach is based on theoretical conceptions of dissociation and available empirical knowledge. This deductive strategy is often used to guide the process of item compilation, as scales constructed using this approach are said to communicate information more directly to the assessor, and they are more economical to build and to administer (Burisch, 1984a,b).

#### **3.1.1.2 Itemetric approach**

The itemetric approach, also called the inductive or internal or internal consistency approach allows the data to speak for themselves. A collection of items is administered to an appropriate sample of subjects and statistical analysis such as factor analysis or correlation of responses to the scale items is used to eliminate, retain, or modify items.

#### **3.1.1.3 Criterion group approach**

The criterion group approach is also called the external or empirical approach, because the scale is tested in contrasting samples, and items are retained according to



their ability to differentiate between two or more so-called criterion groups of people. This is the surest way to determine whether a scale would identify the population that suffers from the condition measured by the scale.

All three of the above approaches may produce inventories with similar degrees of validity or predictive effectiveness (Burisch, 1984a,b). However, a combined approach has the benefit of adding value from several perspectives.

### *3.1.2 Formats of scales*

In addition to the merits of the various approaches to the construction of a scale, the validity, reliability, and clinical value of a scale also depend on the format of the scale and, in particular, on the way scale items are worded, on the instructions for completion and for rating of scale items, on the visual layout of the scale contents, and on whether the scale is rated by the subject or by an interviewer.

#### **3.1.2.1 Self-rating or observer-rating**

Self-rating and observer-rating scales both have advantages and disadvantages.

##### *3.1.2.1.1 Advantages of observer-rating measures*

A scale that is rated by an observer (clinician or otherwise) is often considered to yield a more objective measurement of the phenomenon under study, than a self-rating scale would. In addition to gaining objectivity, the contribution of clinical acumen further enriches an observer-rated scale measurement.

##### *3.1.2.1.2 Disadvantages of observer-rating measures*

The biases and personal prejudices of an interviewer may have an adverse effect on the reliability of a scale, and this problem often tips the balance in favour of the construction of a self-rating scale.

#### **3.1.2.1.3      *Disadvantages of self-report measures***

One possible disadvantage of a self-report measure is that the subject may misrepresent responses due to, say, the envisaged personal consequences of their responses. But the effect on validity of faking is not known (Burisch, 1984a,b). Another possible disadvantage is that “on the basis of self-ratings alone, clinicians cannot tell patients anything they do not already know” (Burisch, 1984). A third possible disadvantage of a self-report measure comes into play when the terminology used in the scale is esoteric or difficult to comprehend, or when the subject is not familiar with the jargon used.

#### **3.1.2.1.4      *Advantages of self-report measures***

Over against these disadvantages, Burisch (1984) quotes studies to prove that self-ratings are on average more valid than corresponding questionnaire scales. The difference was not large, but very consistent. Self-rating scales are also more economical to construct and to administer.

#### **3.1.2.2 Instructions for completion and for ratings**

The instructions at the top of the scale can specify responses; for example, the instructions can indicate the time frame to which the items refer. Simple instructions increase the likelihood that all subjects would respond in the same way.

#### **3.1.2.3 Visual layout of scale contents**

The visual layout of a scale can facilitate or complicate its completion, for example, short lines are read more easily than long lines.

#### **3.1.2.4 Wording of scale items**

The wording of scale items may lead the subject to respond to the items in certain ways. For example, items phrased in the negative (“I do not feel anxious” versus “I feel anxious”) would yield scores that represent the opposite to scores for positively phrased items.

### **3.2 *Scoring of responses to scale items***

Decisions about how the scale should be scored depend on how detailed the scale needs to be, or the extent to which responses need to be independent from the respondent’s interpretation. For example, a scoring system where a single word needs to be circled from three possibilities such as mild, moderate, or severe, may elicit varying responses, depending on the individual’s mind-set and on the personal meaning those three specifiers usually have for the individual.

The first choice is between unipolar and bipolar scoring and subsequently one of several possible ways to measure or quantify the response could be chosen.

#### **3.2.1 *Unipolar versus bipolar scoring***

In unipolar scoring systems a single term or phrase is used (e.g., strength), and the score indicates the extent to which the respondent possesses that characteristic. In bipolar scoring systems two extreme categories are indicated by two contrasting terms or phrases, between which the respondent indicates a score on a continuum (e.g., weak - strong).

#### **3.2.2 *Measuring of responses to scale items***

A numerical scale provides a series of ranked, numbered categories, of which the respondent is required to mark the most appropriate one. The instruction here might

be “Circle the appropriate number (1, 2, 3, 4, or 5) to indicate the extent to which the statement applies to you, where 1 = not at all applicable, and 5 = very applicable.” The numbers might be replaced by words or phrases, such as never / seldom / frequently / all the time, without altering the scale’s classification as a numerical scale, since the phrases are later replaced by numbers during the analysis of the data.

A graphic scale (also called a visual analogue scale) is frequently used because it leaves the respondent greater freedom of choice than is the case with a few independent categories. The graphic scale consists of a line (usually a horizontal line) anchored by descriptive phrases. Sometimes additional descriptive phrases are placed along the line between the extremities. The respondent is required to mark the line where the descriptions best suit them, and the distance from the left extremity to the respondent’s mark is later measured.

A standard scale compares the respondent or the respondent’s behaviour against a set of specific standards. A behaviourally anchored scale also has a set of specific standards but, in addition, the categories of the relevant behaviour or characteristic are described in detail. Although potentially quite accurate, these kinds of scale depend to an extent on the frame of mind of the respondent.

In a forced-choice scale, the respondent is required to choose, e.g., only one of two statements that are closely matched. This method minimises the influence of personal biases, but it is potentially problematic because neither option might apply.

### ***3.3 Validation of a psychiatric rating scale***

Validity refers to the scale’s ability to measure what it was designed to measure, under the conditions and in the populations for which it was designed. Different kinds



of validity<sup>7</sup> can be distinguished, depending on the ‘standard’ against which the scale is measured.

### *3.3.1 Content validity*

Content validity refers to the compatibility of the scale items with what is accepted among experts or leaders in the field as the actual domain. It involves a careful, systematic analysis of the content of the instrument by experts who are familiar with the variables or constructs purportedly measured by it. This forms a part of the theoretical approach to the construction of a scale.

### *3.3.2 Criterion-related validity*

Criterion-related validity refers to the ability of the scale to distinguish between contrasting groups of people on the basis of certain criteria. It makes use of correlation and regression analyses, and exemplifies the criterion-group approach to the construction of a scale. Depending on the availability of an external criterion or so-called gold standard for the condition that is measured, criterion-related validity can be tested externally or internally. The latter method uses an internal substitute for an absent gold standard (or external criterion).

#### **3.3.2.1 External criterion-related validity**

External criterion-related validity depends on the availability of a so-called gold standard, which is known to identify correctly the relevant population. The ability of the new scale to identify that same population is tested. Concurrent validity and predictive validity represent two ways of testing external criterion-related validity.

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<sup>7</sup> The descriptive terms I use for the different kinds of validity are reasonably representative of the way these terms are usually used in the psychiatric literature. Unfortunately, the same terms are occasionally used by various authors to denote different concepts.

### **3.3.2.1.1      *Concurrent validity***

Concurrent validity refers to a comparison of the responses to the scale items by two contrasting samples of people. The method of testing concurrent validity in contrasting groups also contributes towards the testing of construct validity.

#### **3.3.2.1.1.1      Error bars<sup>8</sup> to assess the difference between contrasting groups**

Error bars can be used for the visual presentation of the difference in scale scores between those with and those without the condition the scale is supposed to identify. The distribution of the responses may be represented graphically, e.g., by 95% confidence intervals. If the two sets of confidence intervals are separated by a distance corresponding to twice the (largest) standard error of the mean, the interpretation is usually that the scale scores of the two samples (as selected on the basis of the external criterion) differ significantly, and therefore that the new scale exhibits concurrent validity.

#### **3.3.2.1.1.2      Testing the difference between scores of contrasting groups**

The difference between the scale scores of the group of people with and those without the condition the scale is supposed to identify may also be tested via hypothesis testing, for example, by the T-test for independent samples.

### **3.3.2.1.2      *Predictive validity***

Predictive validity refers to the ability of the scale to predict correctly the presence or absence of a “diagnosis” or condition (Altman, 1991). In other words, predictive validity refers to the ability of the scale to identify correctly to which group or category a person belongs - the group who suffer from the relevant condition, or the

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<sup>8</sup> An error bar consists of the graphic presentation of the sample mean and a factor of the standard error of the mean, the latter represented as ‘whiskers’ on both sides of the mean.

group who do not suffer from the relevant condition - as determined by the external criterion. Some of the variables that are calculated in the course of predictive validity testing refer to the value or the clinical usefulness of the scale to increase the certainty of the diagnosis, at a certain cut-off score on the scale.

The first step is to determine the best possible cut-off score on the scale, a cut-off score that would best be able to predict correctly to which group an individual belongs, or to which diagnostic group a patient belongs.

#### 3.3.2.1.2.1 Cut-off score

A range of possible cut-off scores, based on the error bars mentioned under section 3.3.2.1.1.1 above, is considered in turn (Altman, 1991). The sensitivity and specificity are calculated for each of the possible cut-off scores.

The sensitivity of the cut-off score equals the proportion of patients who suffer from the relevant condition and who are correctly identified as suffering from the relevant condition by that cut-off score. The sensitivity thus equals the ratio between the number of affected patients correctly identified and the total number of affected patients. The specificity of the cut-off value equals the proportion of non-affected patients correctly identified as not suffering from the relevant condition. Thus, the specificity equals the ratio between the number of non-affected patients correctly identified and the total number of non-affected patients.

A graphical approach may be followed in choosing the best cut-off score. Sensitivity is plotted against '1 - specificity' for each cut-off score, and the points joined, thus obtaining a "receiver operating characteristic" (ROC) curve. An assumption may be that the "cost" of a false negative prediction of the relevant diagnosis is the same as that of a false positive prediction. The cut-off that maximises

the sum of the sensitivity and specificity (the point nearest to the top left-hand corner of the graph) would then be taken as the best cut-off score. However, the ROC curve takes no account of the prevalence of the relevant disorder, and approaches the data from the diagnosis side.

#### 3.3.2.1.2.2 Posterior probabilities

The data may then be examined from the side of the scale score (the chosen cut-off score), and the positive predictive value of the cut-off score and the negative predictive value of the cut-off score are used for expressing the posterior probabilities (Altman, 1991).

The positive predictive value (PPV) of the cut-off score is calculated as the proportion of patients with a scale score above the cut-off score, correctly identified as affected by the relevant condition. Thus, the PPV equals the ratio between the patients with a scale score above the cut-off score, correctly identified as affected, and the total number of patients with a scale score above the cut-off score.

The negative predictive value (NPV) of the cut-off score is calculated as the proportion of patients with a scale score below the cut-off score, correctly identified as not affected by the relevant condition. Thus, the NPV equals the ratio between the patients with a scale score below the cut-off score, correctly identified as not affected, and the total number of patients with a scale score below the cut-off score.

However, the PPV and NPV as calculated here would have limited value since the real positive and negative predictive values depend on the prevalence of the relevant condition (also called the prior probability of the condition or disorder). A low prevalence would result in a high negative predictive value and a low positive



predictive value. Conversely, a high prevalence would result in a high positive predictive value and a low negative predictive value.

Since the prevalence should be taken into consideration, the PPV and NPV may be calculated as follows after Bayes' theorem (Altman, 1991):

$$PPV = \frac{\text{sensitivity} \times \text{prevalence}}{\text{sensitivity} \times \text{prevalence} + (1 - \text{specificity}) \times (1 - \text{prevalence})}$$

$$NPV = \frac{\text{specificity} \times (1 - \text{prevalence})}{(1 - \text{sensitivity}) \times \text{prevalence} + \text{specificity} \times (1 - \text{prevalence})}$$

The values of PPV and (1 – NPV) are the revised estimates of the prevalence of the diagnosis for those patients who have scale scores above or below the cut-off score, and are also known as the ‘posterior probabilities’ (Altman, 1991). Thus, the difference between the prior probability (prevalence) and the posterior probability of diagnosis would give an indication of the usefulness of the cut-off score to predict the presence or absence of the diagnosis.

### 3.3.2.1.2.3 Post-test odds

The probability of a scale score above the cut-off score if the patient truly suffered from the condition, is compared to the probability of a scale score above the cut-off score if the patient did not suffer from the condition. The ratio of these probabilities is called the ‘likelihood ratio’ (Altman, 1991), and can be calculated as follows:

$$\text{Likelihood ratio} = \frac{\text{sensitivity}}{1 - \text{specificity}}$$

The *odds* (or *pre-test<sup>9</sup> odds*) of the diagnosis, based merely on the prevalence of the condition, are given as follows:

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<sup>9</sup> The ‘test’ here refers to the chosen cut-off score.

$$\text{Pre-test odds} = \frac{\text{prevalence}}{1 - \text{prevalence}}$$

Corresponding to the PPV, the *post-test odds* = *pre-test odds* x *likelihood ratio* are calculated, which indicate the odds against the diagnosis when the scale score is above the cut-off score, taking into account the prevalence of the condition.

The likelihood ratio thus measures the change in certainty of diagnosis as a result of using the chosen cut-off score, irrespective of the prevalence. The post-test odds take into consideration the prevalence, and indicate the usefulness of the chosen cut-off score for increasing the certainty whether the cut-off score correctly identifies a patient as belonging to the “affected” group.

### **3.3.2.2 Internal criterion-related validity**

Often there is no external criterion for the construct that is being measured, e.g., in the case of a psychiatric disorder, the diagnostic criteria may be vague or inadequately tested. In such cases, in the absence of a well-defined external criterion, an internal criterion may be used in validation. The total score of the scale may then be taken as the criterion, and the correlation of each item with the total score will test the internal validity of the scale. Similarly, the correlations of items with their respective subscales will give an indication of the internal validity of each subscale.

The correlations can be assessed at the following levels:

- Item-total correlations
- Item-subscale correlations
- Subscale-total correlations

### **3.3.3 Construct validity**

The essence of construct validity is whether high and low scores of the scale behave in ways they are expected to behave according to theory or logical reasoning. For example, a high score on one depression rating scale, at the same time as a low score by the same individual on an alternative depression rating scale, would be an unexpected result.

Construct validity (Figure 5.8) is a broad concept that also draws from the other 2 validity-related concepts, namely content validity and criterion-related validity, which also contribute to construct validity.

The testing of different kinds of construct validity depends on the degree of correspondence of the new scale to other scales that measure the same phenomenon (convergent validity), on the lack of correspondence between the new scale and other scales that measure different phenomena (discriminant validity), on the characterisation of main trends in the matrix of correlations among the items of the new scale (factor analysis), and on questions to individuals about their responses to the scale items.

#### **3.3.3.1 Internal factor analysis<sup>10</sup>**

The mathematical procedure of factor analysis reduces a large correlation matrix into a smaller number of ‘supervariables’ or factors, among which patterns of interrelationship are more easily seen. A factor analysis of the scores on all the items of a new scale will examine the extent to which the various items of the scale accord in measuring one or more common themes. The analysis groups the items into factors that appear to measure common themes, each factor being distinct from the others.

Internal factor analysis represents the itemetric approach to scale construction. Although it contributes towards construct validity, it can also be regarded as a form of internal consistency testing (see section 3.4.2 under reliability testing).

Principal components analysis, which is variously considered a form of factor analysis or theoretically distinct from factor analysis (Morley & Hunt, 1996), is usually performed, with varimax rotation, in order to maximise the likelihood of obtaining a simple factor structure. Factor scree plots are used in decisions about the significance of individual factors, in order to limit the number of factors to those that are “statistically significant”.

### **3.3.3.2 Convergent validity**

Convergent validity refers to the extent to which the scale under construction measures the same phenomenon that another (proven) scale does. This procedure follows the criterion-group approach to the construction of a scale.

#### **3.3.3.2.1      *Comparing the scores of different scales by means of bar charts***

Clustered bar charts can be used to present the comparison between the scores of the scale undergoing convergent validity testing and the scores of the other (validated) scale visually, after ensuring that the scores are of the same order of magnitude by converting the scores to the same numerical scale. The less the difference in heights between the two bars, the better the convergent validity between the scales.

#### **3.3.3.2.2      *Testing the statistical association between scores of different scales***

The degree of statistical association between the scores of the two scales may then be tested using, for example, Spearman’s rho correlation coefficients.

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<sup>10</sup> The term ‘internal’ factor analysis is used here, in order to contrast it with what is later called ‘external’ factor analysis (section 3.3.3.3.1).



### **3.3.3.3 Discriminant validity**

Discriminant validity (which also follows the criterion-group approach) assesses whether the scale under construction measures something other than what is measured by another (proven) scale. For example, if the Beck Depression Inventory (Beck, 1987) had good discriminant validity from the Beck Anxiety Inventory (Beck, 1990), one could conclude that the 2 scales measure different groups of symptoms.

#### **3.3.3.3.1 *External factor analysis***

Principal components analysis with varimax rotation is performed on pooled items from both the scale undergoing discriminant validity testing, and from the scale or scales to which the new scale is being compared. The hypothesis is that if these scales measure different phenomena, the differences would be reflected in the factor loadings - the items of the different scales would load onto different factors. Again, the scores need to be of the same order of magnitude, and therefore should be converted to the same numerical scale prior to performing the factor analysis.

### **3.3.3.4 Questions to individuals about their responses**

Questions to respondents about their responses and about what influenced them in making decisions about responses, may contribute towards construct validity.

## **3.4 *Reliability testing of a psychiatric rating scale***

A scale's reliability reflects the extent to which the instrument measures consistently, or the degree to which the item scores are free from measurement errors. According to classical test theory (Aiken, 1996), reliability is defined as the ratio of the true variance of the scores to the observed variance of the scores, given the administration

of the scale to a certain population under certain conditions. Reliability testing follows the itemetric approach to scale construction.

Various methods for testing reliability depend on an analysis of the correlations among item scores, viz. correlations between any two items (item-item correlations), correlations among all the items in the scale (internal consistency), correlations between parallel forms of the scale or two halves of the scale (split-half reliability), and correlations between scores obtained on the same scale at different occasions (test-retest reliability).

#### *3.4.1 Item-item correlations*

Correlations that are too high between any two items in the scale, for example, above 0.9, might indicate that those scale items may be redundant. If so, those items may be revised or discarded.

#### *3.4.2 Internal consistency*

Internal consistency represents the extent to which all items in a scale measure the same variable or construct. Thus, although internal consistency is a measure of reliability, it also contributes towards construct validity (cf. section 3.3.3 above).

Cronbach's alpha is a commonly used coefficient of internal consistency. It indicates the degree to which different items exhibit a positive correlation. An internal consistency coefficient above 0.7 is considered adequate.

In order to identify any subscale that is not internally consistent, and that would therefore adversely influence the internal consistency of the entire scale, the internal consistency may be tested for the entire scale and for each subscale.

### ***3.4.3 Parallel forms of a scale***

Research and practice that involve scales often require multiple forms of the same instrument, since the ratings on a second or subsequent administration of a scale might be biased by the ratings on the first administration of the scale. Two or more forms of the scale are therefore constructed and then 'equated'. The result - a coefficient of equivalence between the scales - represents an extension of internal consistency testing.

Instead of administering 2 alternate forms of a scale in order to reduce the cost of constructing 2 scales, a single scale is often constructed and the split-half reliability tested.

#### **3.4.3.1 Split-half reliability testing**

In the method of split-half reliability testing, items are divided into 2 groups; for example, all even-numbered items are grouped together and all odd-numbered items together. The 2 halves are subjected to a test of their homogeneity, e.g., by the Spearman-Brown or Guttman methods (Aiken, 1996).

### ***3.4.4 Test-retest reliability***

This analysis is usually performed to prove that a certain scale measures a stable phenomenon (such as a personality trait) consistently over time, i.e. that the same scale administered to the same person after a certain time interval would yield the same result. Test-retest reliability depends on the correlation between the score at the time of the first administration of the scale, and the score at the time of the second administration of the scale. It represents the itemetric approach to scale construction.

### ***3.5 Testing of a psychiatric rating scale for sensitivity to temporal variability***

Sensitivity to change may be examined by correlational studies (such as those used during the testing of test-retest reliability - cf. section 3.4.4 above), by examination of confidence intervals and by hypothesis testing.

#### ***3.5.1 Lack of test-retest reliability***

It might be hypothesised that a possible lack of test-retest reliability would demonstrate that the scale does not measure the relevant phenomenon (that is thought not to be stable over time) consistently over time, and that therefore the scale is sensitive to temporal variability. However, the conditions at the first and second administration of the scale might be identical, and there might be no experimental intervention aimed specifically at altering the intensity of the measured phenomenon. Therefore, the scores at the 2 administrations of the scale may be anticipated to correlate highly, and test-retest reliability is not necessarily useful in an assessment of the sensitivity of the scale to temporal variability.

#### ***3.5.2 Error bars to assess the difference between scores***

Error bars may be used for the visual presentation of the difference between the scores obtained at the first completion of the scale and the scores obtained at the second completion of the scale. The distribution of the responses on the two occasions is represented graphically, e.g., by the 95% confidence intervals. If the two sets of confidence intervals are separated by a distance corresponding to twice the (largest) standard error of the distribution, the interpretation is that the scale scores



change significantly between the two occasions, and therefore that the new scale is sensitive to temporal variability.

### *3.5.3 Testing of the difference between scores on two occasions*

The difference between the scores obtained at the first administration of the scale and the scores obtained at the second administration of the scale may be assessed statistically by hypothesis testing using, for example, the paired samples T-test. A result of a statistically significant difference between scores obtained at the first administration and at the second administration is used to demonstrate that the two sets of scale scores do not ‘statistically’ belong to the same population. However, the scores actually do come from the same population, and the implication of a statistically significant difference in scores is taken to show that the scale scores change significantly within the specified period of time, and therefore that the scale is sensitive, for example, to changes in the responses to items.

## *3.6 Conclusions*

This focused review demonstrated a variety of methods that may be used in the development and psychometric testing of psychiatric rating scales. A combination of these methods was subsequently applied in the development and psychometric testing of the SSD. An important requirement was that the SSD had to be true to its purpose as a state scale. Therefore, the SSD had to be sensitive to the sudden appearance or change in the intensity of a person’s dissociative symptoms.

Furthermore, a combination and serial use of the theoretical, itemetric, and criterion-group approaches at different stages of the development and psychometric

testing allowed for an accountable theoretical basis, statistical soundness, and clinical relevance of the SSD.

## The State Scale of Dissociation: Construction

Chapter 2 argues for the development of a state scale of dissociation, since existing measures of dissociation are restricted to the measurement of an enduring tendency to dissociate, or the lifetime prevalence of dissociation, or the frequency or severity of dissociative experiences during a specified period of time in the past (see Chapter 2, section 2.5.3, for an examination of the time frames of these measures). However, rapid changes in “state”, for example, such as transient depersonalisation in complex partial epilepsy (Luciano, 1993) are not measurable by these scales. In contrast, a psychometrically validated measure of dissociative states should be sensitive to momentary (on-off) alterations and short-term variability in duration of dissociative symptoms.

### **4.1**    *Aim*

The aim of this chapter is to address the need for a state scale by constructing a user-friendly scale that would measure dissociative experiences at the time they occur, that would be sensitive to the intensity of dissociation, as well as sensitive to momentary alterations or the short-term variability in the duration of dissociative symptoms, and that would be informed by existing scales rather than be unprecedented.

Note that this chapter describes the construction of a draft version of the State Scale of Dissociation. This version of the SSD was subsequently applied in a pilot study (Chapter 5, section 5.3) aimed at revision of the items, after which the final

version of the SSD was subject to further psychometric validation and reliability testing (Chapters 5 - 7).

## **4.2 Objectives for the construction of the SSD<sup>11</sup>**

### **4.2.1 A scale informed by existing measures of dissociation**

The SSD was planned to be compatible with current theories about dissociation and its domain, as reflected *inter alia* by the item content of the existing measures of dissociation. This would have the additional benefit of the results from previous studies of psychometric validation performed on the items of existing measures of dissociation.

### **4.2.2 Measuring dissociative experiences at the time they occur**

The SSD was planned to measure dissociative experiences at the time they occur, i.e. it was planned to be a pure state measure.<sup>12</sup>

### **4.2.3 Sensitivity to the intensity of dissociative experiences**

The SSD was planned to be sensitive to the intensity of dissociative experiences.

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<sup>11</sup> One of the sources that articulates clearly the assumptions that underlie the purposes of a scale, is the article by Andreasen (1989) on the conceptual and theoretical foundations of the widely used Scale for the Assessment of Negative Symptoms (SANS). The development of the SSD shares all but one of these assumptions. The aim of developing a state scale of dissociation is in line with the 6<sup>th</sup> of the above "assumptions", i.e. that rating scales designed to assess psychopathology should be sensitive to change. The 4<sup>th</sup> assumption is that ideally symptoms should be defined in such a way that their underlying neural mechanisms could be identified, and the latter is envisaged for the SSD in the study of the EEG correlates. The only assumption that was not shared in the development of the SSD, was her 2<sup>nd</sup> assumption that reliability was best achieved through the use of objective observational items, since it did not suit the intentions of the SSD, as will be discussed in section 4.4.2.

<sup>12</sup> A pure state measure would be expected to be sensitive to the temporal variability of dissociative symptoms. The sensitivity of the SSD to momentary alterations or the short-term variability in the duration of dissociative symptoms was subsequently tested (Chapters 5 - 7).



#### *4.2.4 A user-friendly scale*

The fourth objective was to develop a user-friendly scale that would be easy to administer and to complete, with clear instructions and unambiguous items.

### *4.3 Design*

The above objectives were met by transforming items from existing scales, by formatting the SSD as a self-report measure, and by using a graded scoring system, simple instructions, and a plain layout.

#### *4.3.1 Transforming items from existing measures of dissociation*

A framework was drawn up for the selection and organisation of suitable items from the existing measures of dissociation. The resultant seven categories of dissociative symptoms represented the construct of dissociation in a scientifically accountable way, in order to meet the objective that the SSD would be informed by existing scales. The framework of seven symptom groups would facilitate the communicability of the SSD, and thus illustrated the theoretical approach to the construction of a scale (Burisch, 1984; Chapter 3, section 3.1.1.1).

#### *4.3.2 Formatting and wording of the SSD*

The retained items were modified to fit the format of the SSD. The subjective nature of many dissociative experiences (especially when they are mild to moderate) may make them unnoticeable to an observer. Therefore, the preferable way to measure those experiences at the time that they occur, would be to rely on a subject's self-report. The SSD was thus formatted and worded as a present-state, self-report measure.

### *4.3.3 Scoring of the SSD*

The scoring system of the SSD had to be detailed enough to be sensitive to the intensity of dissociative experiences, and flexible enough to allow the subject the greatest possible freedom of expression. A modified visual analogue scale was the solution.

### *4.3.4 Instructions and visual layout of the SSD*

The use of simple instructions, an uncluttered layout, columns, and short phrases, would all contribute to meet the objective of user-friendliness for both the patient or subject, and the clinician or researcher.

## *4.4 Methods*

The methods are described under the same headings as the design section, and detail the transformation of items from the existing measures of dissociation, the formatting, wording, and scoring of the SSD, and the instructions and visual layout of the SSD.

### *4.4.1 Transforming items from existing measures of dissociation*

A framework was drawn up for the selection of suitable items from the existing measures of dissociation. The existing measures were studied for dissociative symptoms that fitted into the framework and could therefore be retained for the SSD. Those items were sorted according to the framework. Certain symptoms were excluded from the SSD.

#### **4.4.1.1 A framework for the SSD**

The approach was to include in the SSD psychiatric symptoms, rather than paranormal experiences, in order to increase the specificity of the SSD for dissociative

symptoms at the more pathological end of the continuum. To this end, the 5-symptom model (Steinberg et al., 1990, 1993, 1994) that informed the DSM-IV (APA, 1994), and that approximates the ICD-10 description of dissociative psychopathology the most closely of all the scales, provided an initial, tentative framework of 5 core symptoms (amnesia, depersonalisation, derealisation, identity confusion, and identity alteration).

A category of conversion symptoms was added to account for the ICD-10 (WHO, 1992) inclusion of these with the dissociative disorders. Specifically, the SSD includes conversion symptoms representative of the three subsections in ICD-10, viz. motor symptoms (paralyses and pareses), convulsions, and anaesthesia or sensory loss.

The decision to include conversion in the SSD was made despite Martin's (1996) plea in the DSM-IV Sourcebook for the classification in DSM-IV of conversion disorder with the somatoform disorders. He quoted studies demonstrating an association between conversion disorders and somatoform disorders (especially somatisation disorder and somatoform pain disorder), a high incidence of conversion symptoms in the somatoform disorders, and a high incidence of somatoform symptoms in the conversion disorders. While acknowledging an aetiological link between the conversion and some of the dissociative disorders, the artificial nature of a segregation between "physical / pseudoneurological" symptoms and "symptoms involving the integrative functions such as identity, memory, and consciousness / cognition", as well as the undesirability of a discrepancy between DSM-IV and the international classification system, he still supported the descriptive, phenomenological nature of DSM-IV and recommended the retention of conversion disorder among the somatoform disorders in DSM-IV. However, the aetiological

links between the conversion and some of the dissociative disorders justified the method of including conversion symptoms in the SSD.

Symptoms of hypermnesia were included in the SSD following reports of a high frequency of flashbacks and intrusive memories after traumatic events, as in post-traumatic stress disorder (APA, 1994), the controversial role of traumatic aetiology in the development of the dissociative disorders (Butler et al., 1996), and the suggested role of overconsolidated memories in dissociative hypermnesias (Marocco et al., 1994).

The method was to include under these headings a wide range of symptoms traditionally regarded as dissociative, without tapping into other constructs such as depression or anxiety that may occur comorbidly. This contrasts with previous scales where the symptom clusters often crossed several syndromes (Table 2.1, Chapter 2).

The methodological framework consisted of 7 subscales in the following order: derealisation, depersonalisation, identity confusion, identity alteration, conversion, amnesia, and hypermnesia.

The relation between psychosis and dissociation was also considered in the method of construction of the SSD. Previous trait scales of dissociation such as the DDIS (Ross et al., 1989), the Checklist of dissociative and anxiety phenomena (Cardena & Spiegel, 1993), the Kelley-Kodman Self-report Questionnaire of Dissociation and Multiple Personality (Cooper, 1993), and the Phillips Dissociation Scale (Phillips, 1994), included clear hallucinatory experiences. Furthermore, in Kluft's study (1987) all of 30 patients with multiple personality disorder endorsed an average of 3.6 Schneiderian first-rank symptoms. Overlapping symptoms in multiple personality disorder and schizophrenia include auditory hallucinations, Schneiderian symptoms, perceptual disturbances, and depersonalisation (Steinberg et al., 1994).



The latter authors also note the non-overlapping symptoms characteristic of schizophrenia and not MPD - they include chronic flat affect, chronic psychosis with loosening of associations, autism, and ambivalence. These authors do not, however, continue to name the non-overlapping symptoms of MPD.

The SSD was constructed with less overlap between dissociative symptoms and symptoms of psychosis, than the overlap in the existing measures of dissociation. The existing measures of dissociation that contain hallucinatory experiences (referred to in the previous paragraph) do not address explicitly their sometimes prominent overlap with the construct of psychosis. For the SSD, those "psychotic" symptoms that corresponded closely to items in previous dissociation scales, and still fitted into the above 7-tiered framework, were retained. In these cases the items were worded in such a way that they were not representative of florid psychosis but more like dissociative experiences.

#### **4.4.1.2 Constrain by retaining existing items and not creating new ones**

The SSD was constructed by the transformation of items from previous measures, most of which had undergone validity and reliability testing. The SSD thus benefited from that previous psychometric validation.

The existing measures of dissociation (Table 2.1, Chapter 2) were studied and the items that fitted into the above 7-tiered framework for the SSD were retained. In addition, selected scales of general psychopathology, of psychosis, and of epilepsy, were studied (Chapter 2, section 2.5.1.2) and any of their items that fitted into the above framework for the SSD, were retained.

The wording of the items in the SSD corresponds fully or partly with the wording in the parent scales, unless specifically indicated in the results section (section

4.5), by a quotation from the previous scale, indicating a slight difference in emphasis. On the one hand, the words “as if” were retained where they featured in a parent scale item, thus allowing for an “as if” quality to some dissociative experiences, while acknowledging that dissociative symptoms in patients with dissociative disorders are often marked by an “as if” quality (Steinberg et al., 1994) in the presence of intact reality testing, even if the words “as if” do not appear in the item. On the other hand, the words “as if” were not introduced where the parent scale item did not contain them, so as not to reduce all the items to merely “as if” experiences. Since the SSD is not intended for use only in patients with dissociative disorders, the items were also not worded along an “as if” restriction.

#### **4.4.1.3 Symptoms excluded from the SSD**

As is evident from Table 2.1 (Chapter 2), the existing measures of dissociation often include affective symptoms, probably because of the frequent comorbidity between affective and dissociative symptoms (Putnam et al., 1996). The link between dissociation and affective symptoms has also been considered more inherent than comorbidity would suggest: dissociation, or at least depersonalisation, has been thought by some to belong in the realm of anxiety, as a phobic anxiety-depersonalisation state (Roth, 1969). However, in the interest of a distinct construct, anxiety and depressive symptoms were excluded from the SSD. The independence of the construct dissociation from either anxiety or depression was examined subsequently in the psychometric validation (Chapters 5 - 7).

Other symptoms of a somatic nature, such as pain, were not included, as the somatoform group of disorders has traditionally been considered separate from the “dissociative/conversion spectrum” in that the emphasis in the somatoform disorders

is on the repeated presentation of physical symptoms, together with persistent requests for medical investigations (WHO, 1992). The exclusion of somatic symptoms also served to constrain the scope of the SSD in the interest of a distinct construct. Claims that the somatoform disorders may be related pathogenetically to the dissociative (or conversion) disorders (Nemiah, 1991), and that headaches, abdominal pain and groin pain are common symptoms in dissociative identity disorder (Putnam, 1989; Loewenstein, 1991), will need to be tested in future studies. For the same reasons, transient blindness, deafness, and tremors were excluded from the SSD.

The following groups of symptoms were also excluded: symptoms relating to sleep, dreams, the experience of time, and non-dissociative experiences associated with epilepsy. These symptoms were excluded because they are less commonly acknowledged a part of the dissociative spectrum, and also in the interest of a shorter and more manageable scale. Possible links between sleep-related symptoms (or any of the other groups of symptoms mentioned above) and the construct of dissociation (as subsumed in the SSD) might be tested in future studies.

#### *4.4.2 Formatting and wording of the SSD*

Reiterating what was said under the design section, the subjective nature of many dissociative experiences (especially when they are mild to moderate) might make them unnoticeable to an observer. Therefore, the preferable way to measure those experiences at the time that they occur, is to rely on a subject's self-report. The SSD was thus formatted and worded as a present state self-report measure.

Another reason why a self-report format was chosen for the SSD, was to minimise problems relating to interviewer bias, and the resultant compromise on inter-rater reliability.

#### **4.4.2.1 A self-report measure**

First, the instructions would state the obvious about the scale - that it contains phrases about experiences that the respondent may or may not have at that moment. Having set the time frame, a direct request would follow, to tick for each statement, the box corresponding to the intensity of their experience. These two sentences are followed by an example of how to respond to a phrase. Each phrase would also be phrased in the first person, and clearly refer to the subjective experiences of the respondent.

In order to overcome the problems associated with jargon (cf. section 3.1.2.1.3 on the disadvantages of self-report measures), the items in the SSD were phrased using everyday language as far as possible.

#### **4.4.2.2 Wording with a view to sensitivity to temporal variability**

The SSD was planned to be sensitive to momentary (on-off) alterations and short-term changes in the duration of dissociative experiences. Whereas the items of previous scales were worded to elicit an enduring tendency to dissociate, or the lifetime prevalence of dissociation, or the usual frequency of dissociative experiences, or an indication of the presence or severity of dissociative symptoms during a specified period of time in the past (for example the last month), SSD items were formulated in the present continuous tense or present tense with an appropriate phrase specifying time such as “at this moment” or “right now”.

#### **4.4.3 *Scoring of the SSD***

The scoring system of the SSD had to be detailed enough to allow sufficient grading of the responses (in other words, to be sensitive to the intensity of dissociative experiences), and flexible enough to allow the subject the greatest possible freedom of expression.



An important methodological decision was how pathological or how severe a dissociative experience had to be before it could be included in the SSD, or how normal the experience had to be before it could be included, so as to arrive at a scale that would be useful both in clinical and research situations.

The items included in the SSD had to be measurable in terms of their intensity or severity. Due to the artificial constraints imposed by semantic and numerical (ordinal) rating scales, the choice was made for a graphic rating scale, where ease of rating is combined with the greatest possible freedom of expression.

Graphic rating scales, however, suffer from the methodological problem of cumbersome ‘scoring’ and computer data capture. The length of the line between the left end and the subject’s mark has to be measured, and the distance subsequently entered into a computerised database. Optical scanners have facilitated this process, but there have been problems relating to inaccurate scanner function.

For the SSD, a routine graphic rating scale was modified, and the line of measurement replaced by a row of 10 unnumbered boxes, starting immediately to the right of the phrase “not at all” and ending immediately to the left of the phrase “very much so”. On this modified visual analogue scale, the intensity of the dissociative experience would be indicated by a tick in any one of the row of 10 unnumbered boxes.

#### *4.4.4 Instructions and visual layout of the SSD*

One of the consequences of the choice of a self-report questionnaire is that it needs to be user-friendly for the patient’s (or control subject’s) convenience and complete participation. The use of simple instructions, an uncluttered layout, columns and short

phrases, would all contribute to meet the objective of user-friendliness, for both the patient or subject, and for the clinician or researcher.

The method of arrangement of the items in the SSD also contributed towards its user-friendliness. The items were arranged under their respective subscales. The subscales followed one another more or less in ascending order of severity, and so did the individual items within each subscale. The progression was thus from milder, more common symptoms (more likely to be endorsed) to more severe, rarer symptoms (more foreign to everyday experience). This was done to prevent the possibility of 'shocked' responses by subjects upon early confrontation with some of the more severe dissociative symptoms, such as alteration of identity.

An additional benefit of the arrangement of items under subscales instead of scrambling the items, would be the potential for facilitating 'eyeball analysis' of the data in clinical settings, for an immediate assessment of a patient's symptom profile (which dissociative symptoms the patient experiences), and an immediate impression of the degree or intensity of dissociation.

The items in each subscale were kept close to equal in number for the purpose of facilitating cross-comparisons and equalising reliability potential (Kay et al., 1987), as well as in the interest of equal weightings by the individual subscales towards the total SSD score.

For similar psychometric considerations, items were paired (every odd numbered item with the following even numbered item), so that each pair consisted of similar or slightly overlapping items. This would facilitate the potential future division of the SSD into two equivalent alternate forms for serial administration.

Also in the interest of user-friendliness, subscales that are ‘conceptual neighbours’ (such as identity confusion and identity alteration) were grouped together, even if this disturbed the order of severity slightly.

The easy scoring system (which does not depend on careful reading of, e.g., a behaviourally anchored numerical rating scale), the ease of administration, and the short time required for completion, also contribute to the user-friendliness of the SSD.

**4.5    *Results***

The application of the methods discussed under section 4.4 yielded the following results:

**4.5.1   *The items of the SSD***

**4.5.1.1   Subscales of the SSD**

Table 4.1 provides a summary of the content description of the SSD, i.e. a list of the 7 subscales and which items are subsumed under each subscale.

**4.5.1.2   Origins of the items in the SSD**

Fifty-eight items were formulated, the origins of which are summarised in Table 4.2, and traced in detail below under section 4.5.1.2.2 (“Detailed origins of each SSD item”).

**4.5.1.2.1        *Comparison of item roots in existing scales***

Table 4.2 summarises the origins of all SSD items in 25 existing scales, in three parts: parts a and b contain existing measures of dissociation, whereas part c contains other non-dissociative measures. The symbol ★ in the row of a certain SSD item, under the heading of a certain other scale, indicates that the relevant SSD item originated from

that previous scale (among possible others), either as is, or modified to suit the format of the SSD. The symbol ☼ in the row of a certain SSD item, under the heading of a certain other scale, indicates that the relevant SSD item originated from 2 or more items in that previous scale (among possible others), either as is, or modified to suit the format of the SSD.

#### 4.5.1.2.2 *Detailed origins of each SSD item*

Where the SSD item represented a straightforward present continuous tense transformation from the parent scale item, the item number from the original scale is merely quoted below. Where the transformation also aimed at capturing the meaning of a few parent scale items, the wordings of the parent scale items are also quoted. The abbreviations used for the parent scales are the same as in Table 2.1 and in the descriptions of the scales in Chapter 2. The wording here is the original wording in the first draft of the SSD as used in the pilot study of the psychometric validation. The wording was changed after the pilot study as described in Chapter 5.

##### 4.5.1.2.2.1 *Derealisation*

Item 1: Things around me seem unreal or dreamlike.

From DES item 12; QED item 1; HSCL-D item 7; SCID-D question 79; TSI items 84 and 85; OMSE question 3 of “out-of-body experiences / depersonalisation” (under “autohypnotic” symptoms); TSC-40 item 31; CDAP; DIS-Q items 2 and 29; SASRQ item 7 (as numbered from the top in Table 1 in Freinkel et al., 1994); PDEQ item 1 (as numbered from the top in Table 2 in Marmar et al., 1994); PDS item 16 (MMPI #345); CPSLS items 13 and 14; PPI item 11 of CPES cluster; PSE symptom 47.



**Item 2: Things around me look different from the way they usually do.**

From DES items 12 and 16, phrased in a less severe form, as a pair with item 1 above. Also SCID-D questions 82 and 83; DIS-Q item 39; SASRQ item 10; SDQ-20 item 16 <sup>13</sup>; CPSLS items 13 and 14.

**Item 3: It is as if I am looking at things around me through a fog.**

From DPI item 4 (“wall or veil between me and other people”); DES item 28; OMSE question 3 of “out-of-body experiences / depersonalisation” (under “autohypnotic” symptoms).

**Item 4: I feel far away from what is happening around me.**

From DES item 28; HSCL-D item 14; DIS-Q item 63.

**Item 5: Things around me are looking smaller than they usually do.**

Not from a previous scale. Micropsia was included as a pair with item 6, as another example of altered perception of the surroundings.

**Item 6: Things around me are looking larger than they usually do.**

From SDQ-20 item 19 <sup>13</sup>; PPI item 2 of CPES cluster.

**Item 7: I am in a world of my own.**

Related to DES item 17, as is item 42 below. In this item, however, the emphasis is on absorptive withdrawal from the “real” world of events happening around one. Also from QED item 11; HSCL-D item 13 (“losing touch with reality”).

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<sup>13</sup> As numbered from the top down in Table 1 in Nijenhuis et al. (1996).

**Item 8: I am in a trance.**

From DES item 20 and similar to DES item 17, used as a pair with item 7 above. Also from QED item 7 (“daze”), item 20 (“staring off into space without thinking of anything”), item 25 (“trance-like hypnosis”); DDIS question 69; HSCL-D item 4 (“spacing out”); OMSE question 1 of “spontaneous trances” (under “autohypnotic” symptoms); TSC-40, item 14 (“spacing out”) and item 30 (“passing out”); KKDMP question 11; DIS-Q item 44; CPSLS item 21 (“staring spells”).

#### **4.5.1.2.2.2 Depersonalisation**

Several of the previous scales contained an item referring to an inability to recognise oneself while looking in a mirror, as an example of depersonalisation. That item was not, however, included here, due to the constraints of the usual interview situation.

**Item 9: My body feels vague, indefinite, strange.**

From DIS-Q item 28; SASRQ item 12.

**Item 10: My body seems disconnected from my thoughts, my feelings, my self.**

From DPI items 3 and 10; DES item 13 (“body does not belong to self”); PAS item 17; QED item 6; HSCL-D item 8; SCID-D question 42 (“part of body disconnected from the rest of body”); OMSE question 2 of “out-of-body experiences / depersonalisation” (under “autohypnotic” symptoms), question 2 of “numbing / avoidance / detachment”; CDAP; DIS-Q items 3, 11, 30; SASRQ items 1, 13, and 14; PDEQ item 6 (“felt disconnected from body”); PSE symptom 48.

**Item 11:** It feels as if I am going through the motions of living, but the real me is far away from what is happening to me.

From DPI item 8; PAS item 27; QED item 6; DDIS question 95; SCID-D question 46; CDAP; SASRQ item 14; PDEQ item 11; PSE symptom 48.

**Item 12:** It is as if I am watching my body from the outside.

From DES item 7; QED item 22 (“my soul sometimes leaves my body”); DDIS question 121; HSCL-D items 1 and 5; SCID-D question 38; TSI items 10 and 26; OMSE question 4 of “spontaneous age regression”, question 1 of “out-of-body experiences / depersonalisation” (both under “autohypnotic” symptoms); TSC-40 item 38; KKDMP questions 49 and 62; PDEQ item 5; PDS item 5 (MMPI #50) (“my soul sometimes leaves my body”); PSE symptom 48.

**Item 13:** It feels as if parts of my body or my whole being are unreal.

From DDIS questions 95 and 121; SCID-D question 44; PSE symptom 48.

**Item 14:** My hands or feet or other parts of my body feel as if they have changed in size.

From DPI (unlisted item); QED item 12; DDIS question 121; SCID-D question 49; PDEQ item 6 (“body distorted”); SDQ-20 item 1;<sup>1</sup> SAPS “somatic / tactile hallucinations”; PANSS item G1 (“somatic concern”).

**Item 15:** I feel like a stranger to myself.

From DPI item 7; SCID-D questions 40 and 41.

Item 16:           My self-awareness seems different now: There seems to be either a greater or less difference between self and not-self.

From DPI item 5: “My ordinary feelings of self-awareness seemed different. There seemed to be a greater difference between self and not-self”; item 9: “There was no distinction between 'me' and 'not me'. There was feeling but it was not me feeling”; item 12: as for item 5, but “less difference between self and not-self”. Rephrased to facilitate understanding. Also from OMSE question 1 of “passive-influence symptoms / interference phenomena” (under “process” symptoms); CDAP; DIS-Q item 75; SASRQ item 1; SAPS “thought insertion” under “delusions”; PANSS item P1 (“delusions”); PSE symptom 48; SCL-90-R item 62.

#### 4.5.1.2.2.3     Identity confusion

Item 17:           I do not feel like my real self.

From HSCL-D item 3; TSI items 29 and 75.

Item 18:           This is not me.

From QED item 2; DIS-Q item 7.

Item 19:           I do not know who I really am.

From QED item 4; DDIS question 111; SCID-D question 105; TSI items 16 and 55 (“getting confused about what you thought or believed”); KKDMP questions 16 and 75; DIS-Q items 12 and 17.

Item 20:           I do not feel like a whole person.

DIS-Q items 57 and 59.



**Item 21:**           **There is a struggle going on inside me.**

From PAS items 12 and 49; SCID-D questions 101 and 102; OMSE question 7 of “passive-influence symptoms / interference phenomena” (under “process” symptoms); KKDMP questions 70 (“a voice inside protecting you from another inside”) and 82 (“voices inside your head attacking you”).

**Item 22:**           **I feel torn between doing one thing and another.**

From PAS items 12, 32, and 49; OMSE question 7 of “passive-influence symptoms / interference phenomena” (under “process” symptoms); DIS-Q item 56.

**Item 23:**           **I am talking to myself silently.**

Similar to DES item 21, but that item referred to talking out loud to oneself. Also SCID-D questions 138 - 146, where details of the dialogues are elucidated; KKDMP questions 59 (“talk to inner voices inside your head”) and 85 (“communicate with an imaginary companion”); NCDI item MMPI-2 #551; PSE symptom 64.

**Item 24:**           **My inner voices are talking.**

From DES item 27 and similar to DES item 21; QED item 24 (“imaginary companions”); DDIS question 96 (“talking inside your head”); SCID-D questions 138 - 146 where details of the dialogues are elucidated; TSI item 65 (“hearing someone talk to you who wasn’t really there”); OMSE question 1 of “hallucinations / pseudohallucinations” (under “process” symptoms); KKDMP questions 7 (“voices coming from within your head”), 22 (“awakened by an inner critical voice”), 25 (“inner voice”), and 42 (“inner voices that argue or fight”); DIS-Q item 61; PDS item 10 (MMPI #184) (“hear voices without

knowing where they come from”); NCDI item MMPI-2#551; SAPS “voices commenting / conversing” under “hallucinations”; PANSS item P3 (“hallucinatory behaviour”); PPI item 8 of CPES cluster; PSE symptom 64; SCL-90-R item 16.

#### 4.5.1.2.2.4 Identity alteration

Item 25: I am split into more than one person.

From DPI item 8 (“the feeling that I was two people”); PAS item 53; DDIS question 123; HSCL-D item 11; SCID-D questions 114, 116, 118, 120; OMSE question 1 of “alter attributes / presence of alters” (under “process” symptoms); KKDMP questions 15 and 65; DIS-Q items 20, 57, and 59.

Item 26: I am starting to feel like a different person now (for example, a child).

From SCID-D question 113; OMSE question 1 of “spontaneous age regression” (under “autohypnotic” symptoms); KKDMP questions 12, 16, and 56; DIS-Q item 7.

Item 27: There is another person inside me waiting to come out and take control of my actions and speech.

From DES item 22; QED item 13; DDIS questions 99, 101, and 124; SCID-D question 234; CDAP; KKDMP questions 73 (the part of the question about “without control”) and 92; DIS-Q item 34.

Item 28: My alter ego is about to take over.

Added to form a pair with item 27, and from the same origins.

Item 29: I am not in control of myself now.

From PAS items 7 and 30; DDIS questions 124 and 126. Similar phrases containing the words *actions*, *emotions*, and *speech* were drawn from the SCID-D questions 50 - 53, where they were thought to represent depersonalisation. However, it seems as if this kind of depersonalisation is so severe that it results in confusion or even alteration of identity, or possession, as in item 30. In other words, the person feels different from his/her usual self to the extent that the seat of personal control becomes removed from the person, with resultant diffusion or alteration of the identity. Also from SCID-D question 124; OMSE question 3 of “passive-influence symptoms / interference phenomena” (under “process” symptoms); CDAP; KKDMP question 74; DIS-Q items 34 and 50; PDS item 18 (MMPI #275); NCDI item MMPI-2 #564; PANSS items P1 (“delusions”) and G14 (“poor impulse control”).

Item 30: I feel as if I am possessed by something or someone.

From PAS item 7; QED item 13; DDIS question 104; SCID-D question 124; OMSE question 5 of “passive-influence symptoms / interference phenomena” (under “process” symptoms); KKDMP question 74; DIS-Q item 9; PDS item 2 (MMPI #27); SAPS “delusion of being controlled”; PANSS item P1 (“delusions”); SCL-90-R item 7.

Item 31: I am not in control of my emotions right now.

A more specific example of loss of personal control (see item 29), chosen to form a pair with item 32. Also from PAS item 2; DDIS question 112; TSI

items 13 and 15; TSC-40 item 20; CDAP; DIS-Q item 15; PDS item 1 (MMPI #22); NCDI item MMPI-2 #23; BFI.

Item 32: My mood is changing now (for example, into anger, anxiety, happiness, or a feeling of cosmic consciousness).

From DPI item 11; PAS items 6 and 18; DDIS question 112; SCID-D question 134; TSI item 80; KKDMP questions 29 and 50; DIS-Q items 6, 15, 23; PDS item 1 (MMPI #22); NCDI item MMPI-2#226; BFI; CPSLS items 25 and 27; PPI item 27 of TLS cluster; SCL-90-R items 23 and 24. Added to identify possible subjective correlates of “switches” to an alter personality.

#### 4.5.1.2.2.5 Conversion

Item 33: I am unusually weak or paralysed in one or more of my muscles now.

Addresses one of the three groups of conversion symptoms of ICD-10, i.e. motor symptoms. From TSI item 43; OMSE question 1 of “somatoform symptoms”; KKDMP question 40; PDS item 13 (MMPI #330); SDQ-20 item 2; PANSS item G1 (“somatic concern”); PPI item 18 from TLS cluster; PSE symptom 101; SCL-90-R item 56.

Item 34: I cannot move, but I know what is going on around me.

As for item 33, it addresses one of the three groups of conversion symptoms of ICD-10, i.e. motor symptoms. From KKDMP question 40; PDS item 9 (MMPI #194); SDQ-20 item 10; SANS “physical anergia” under “avolition-apathy”; PANSS items G5 (“mannerism and posturing”), G7 (“motor retardation”), and G13 (“disturbance of volition”); PPI item 9 from TLS cluster.



**Item 35:** If I try to speak now, my voice will be gone or different from usual.

Subsumes the classic conversion symptom of aphonia. From QED item 9; SCID-D question 246; KKDMP questions 66 and 91; DIS-Q item 22; PDS item 14 (MMPI #332); SDQ-20 item 3.

**Item 36:** I cannot control my speech now.

Combines the conversion symptom of aphonia with the sense of lost personal control as first evident in depersonalisation and manifesting more prominently in identity confusion and ultimately in identity alteration. Added to form a pair with item 35. From QED item 9; SCID-D question 246; DIS-Q item 22; PDS item 9 (MMPI #194); NCDI item MMPI-2#529; SDQ-20 item 3; CPSLS items 9 and 11.

**Item 37:** It is as if I am wearing gloves or a body stocking which prevents me from feeling normally.

From CDAP; CPSLS item 5. Formulated to pick up milder forms of anaesthesia and paraesthesia, one of the three groups of conversion symptoms of ICD-10. Added to form a pair with item 38.

**Item 38:** I have numbness in one or more places on my skin now.

From TSI item 60; OMSE question 1 of “voluntary anesthesia / analgesia” (under “autohypnotic” symptoms); CDAP; PDS item 12 (MMPI #273); SDQ-20 items 4 and 20; CPSLS item 6; PSE symptom 101; SCL-90-R item 52. Subsumes one of the three groups of conversion symptoms of ICD-10, i.e. anaesthesia.

Item 39: I feel as if I am going to faint now.

From TSI item 21; OMSE question 1 of “somatoform symptoms”; CDAP; DIS-Q item 26 (“suddenly struck by a black-out”); SASRQ item 25; PDS item 6 (MMPI #174); NCDI item MMPI-2#229. Relates to the third group of conversion symptoms of ICD-10, i.e. seizure symptoms.

Item 40: I am going into a fit or a stupor.

From QED item 14 (“sometimes my limbs move on their own”); OMSE question 1 of “somatoform symptoms”; KKDMP question 11; DIS-Q item 26 (“suddenly struck by a black-out”); NCDI item MMPI-2#229; SDQ-20 items 10 and 13; PSE symptom 101. Added to form a pair with item 39, while exemplifying the ICD-10 group of conversion seizures.

#### 4.5.1.2.2.6 Amnesia

Item 41: My mind feels blank.

From PAS item 38; QED items 3 and 18; HSCL-D items 6 and 12 (“absent-mindedness”); SCID-D question 1; TSI item 20; OMSE question 1 of “blackouts” (under “amnesia” symptoms); DIS-Q items 26 (“black-out”), 44, and 45; SASRQ item 6; PDEQ item 1; PDS item 11 (MMPI #251); NCDI item MMPI-2#229; CPSLS items 21 and 22; PPI item 12 from TLS cluster; SCL-90-R item 51.

Item 42: I am unaware of what is happening around me.

From DES item 17, as for item 7 above, but here the emphasis was on impaired attention with the resultant effect on short-term memory; also TSI item 42; OMSE question 1 of “enthralment” and question 1 of “negative

hallucinations” (both under “autohypnotic” symptoms); DIS-Q items 8 and 31; PDEQ item 1; PDS item 11 (MMPI #251); NCDI item MMPI-2#229; SANS “social inattentiveness” under “attentional impairment”; PANSS items G11 (“poor attention”) and G15 (“preoccupation”); CPSLS item 22.

Item 43: I am having difficulty taking in new information.

From DES item 2 (but phrased less severely); PAS item 20; OMSE question 1 of “micro-dissociations” (under “amnesia” symptoms); CDAP; DIS-Q item 25; SASRQ item 5; PDEQ item 1; PDS item 15 (MMPI #342); NCDI item MMPI-2#565.

Item 44: I am forgetting what I want to do or say.

From HSCL-D item 2; SCID-D question 6; TSC-40 item 25; CDAP; SASRQ item 27; PDEQ item 1; NCDI item MMPI-2#475 and #533; SAPS “distractible speech” under “positive formal thought disorder”; PANSS item P2 (“conceptual disorganisation”); CPSLS item 12; SCL-90-R item 9.

Item 45: I do not remember putting on these clothes.

From DES item 4; QED item 17; DDIS question 91; HSCL-D item 10; OMSE question 1 of “disremembered behaviour” (under “amnesia” symptoms); CDAP; KKDMP question 24; DIS-Q items 5 (relating to driving and/or bicycling), 18, 24, 32, 35, 37, 47, 58; SASRQ item 16; PDEQ item 8; PDS item 8 (MMPI #156); NCDI item MMPI-2#168; CPSLS items 16 and 19; PSE symptom 97.

Item 46: I am uncertain whether I actually responded with a tick to all the previous statements.

From DES items 15 and 24 (“not sure whether things you remember happening really did happen or whether you just thought about doing or dreamed them”); OMSE question 4 of “disremembered behaviour” (“unsure whether you have actually done something or just thought about / imagined / dreamed about doing it”) (under “amnesia” symptoms); DIS-Q items 38 and 55; PDEQ item 8; CPSLS item 16.

Item 47: I do not know what today’s date is.

From DIS-Q item 17; SASRQ item 3; PANSS item G10 (“disorientation”); CPSLS item 16. Added since disorientation to time may reflect an impairment of short-term memory, that may be contributed to by inattention such as during dissociation (Sakai & Miyashita, 1994).

Item 48: I do not know exactly where I am.

From DES item 3 modified to reflect partial amnesia or paramnesia. As for item 47 above, this item was added because disorientation to place may reflect an impairment of short-term memory that may be contributed to by inattention such as during dissociation (Sakai & Miyashita, 1994). Included to form a pair with item 47. Also from PAS item 31; QED item 10; DDIS question 92; OMSE question 1 of “fugues” (under “amnesia” symptoms); KKDMP questions 31 and 69; DIS-Q item 18; SASRQ item 3; PDEQ item 8; PANSS item G10 (“disorientation”); CPSLS items 16 and 18; PPI item 13 from CPES cluster.



#### 4.5.1.2.2.7 Hypermnesia

**Item 49:** This situation feels as if it has happened before.

A déjà vu experience, an illusion of visual recognition in which a new situation is incorrectly regarded as a repetition of a previous memory (Kaplan et al., 1994), may be contributed to by overconsolidated short-term memory, or the intrusion of overconsolidated, possibly traumatic, memories. From DES item 26; DDIS question 103(e); CPSLS item 15. Jamais vu (DES-item 16, a false feeling of unfamiliarity with a real situation one has experienced (Kaplan et al., 1994)) was incorporated in this scale in item 2.

**Item 50:** It is as if I know what is going to happen next.

From CPSLS item 15. Added to form a pair with item 49.

**Item 51:** I am remembering things that I have not thought about for some time.

From DDIS question 94. Added to form a pair with item 52, while reducing the value judgement of the word unwanted, resulting in a more neutral phrase.

**Item 52:** Unwanted memories are entering my mind.

TSI items 8 and 62; CDAP; SASRQ item 19. This item refers to “flashback” memories that may result from overconsolidation of traumatic memories (Marocco et al., 1994).

**Item 53:** I am seeing a past event in my mind's eye right now.

Specifically addresses intrusive visual memories, and forms a pair with item 54. From TSI item 72; OMSE question 6 of “hallucinations / pseudohallucinations” (under “process” symptoms) and question 3 of

**“intrusive imagery / revivifications / flashbacks” (under “PTSD” symptoms);  
KKDMP question 45.**

**Item 54: I am experiencing a flashback.**

**From DDIS question 94; OMSE question 1 of “intrusive imagery / revivifications / flashbacks” (under “PTSD” symptoms); TSC-40, item 7; CDAP. Forms a pair with item 53.**

**Item 55: It feels as if some past event is occurring again now.**

**From DES item 14; SCID-D question 136; OMSE question 2 of “intrusive imagery / revivifications / flashbacks” (under “PTSD” symptoms); CDAP; DIS-Q item 33; SASRQ item 17; CPSLS item 1. Refers to the reliving of memories, not limited to one sensory modality, also reminding of déjà vu experiences, this time used to form a pair with item 56.**

**Item 56: I am hearing one of my memories now.**

**From TSI item 72; OMSE question 3 of “intrusive imagery / revivifications / flashbacks” (under “PTSD” symptoms); CPSLS item 2. Addresses specifically intrusions of auditory memory. Paired with item 55.**

**Item 57: I am smelling one of my memories now.**

**From OMSE question 3 of “intrusive imagery / revivifications / flashbacks” (under “PTSD” symptoms); PPI items 9 (“intense smells that do not have an obvious source”) and 16 (“just before falling down I have had the intense sensation of a smell from childhood”) from the CPES cluster. Paired with item 58.**

Item 58:            I am tasting one of my memories now.

From OMSE question 3 of “intrusive imagery / revivifications / flashbacks”  
(under “PTSD” symptoms). Paired with item 57.

4.5.2 *Scoring of the SSD*

As described under the methods section (section 4.4.3), the subjects rate their response to each item on a row of 10 unnumbered boxes, by placing a tick in one of the boxes:

Not at all        ☐☐☐☐☐☐☐☐☐☐        Very much so

4.5.3 *Instructions and visual layout of the SSD*

Appendix 1 is the draft version of the SSD containing the items as worded above, as used in the pilot study to the psychometric validation. Note that Appendix 3 is the SSD as revised after the pilot study and after consultation with experts, and as used in the further psychometric validation and in the study of the EEG correlates of dissociation.

4.6    *Discussion*

This chapter described how the process of construction of the SSD was designed to meet the objectives of section 4.2, i.e. how the process of construction would allow the SSD to be informed by existing measures of dissociation, to measure dissociative experiences at the time that they occur, to be sensitive to the intensity of dissociative experiences, and pending confirmation from the application of the SSD, to be user-friendly.

The derivation of the SSD from existing measures of dissociation would ensure that the construct of dissociation, as reflected in the SSD, represented a

reasonable consensus of the domain of dissociation. The self-report format and wording of the SSD would allow it to measure dissociative experiences at the time that they occurred, and therefore to be a state measure of dissociation. The scoring system of the SSD would allow it to be sensitive to the intensity of dissociative experiences. The instructions and visual layout of the SSD would contribute towards its user-friendliness.

The extent to which the objectives were met, will be discussed under the following four headings:

#### *4.6.1 The construct of dissociation as reflected in the SSD*

Based primarily on the classification of dissociative symptoms that informed DSM-IV (APA, 1994), augmented by conversion symptoms (following the example of ICD-10 (WHO, 1992)) and by hypermnesic symptoms (motivated by trauma research), the SSD presents a 7-tiered construct of dissociation.

The fact that the SSD was informed by existing scales afforded increased validity and reliability, since most of the existing scales had undergone psychometric validation. The SSD also gained from other authors' experience of methodological problems.

The main limitation of the derivation of the SSD from existing measures of dissociation is that the 7-tiered framework merely represents a reasonable consensus of the domain of dissociation as received from the literature and existing measures of dissociation. The seven categories are still surrounded by a fluid boundary. The SSD as such goes no further towards a clear definition of the construct of dissociation.

However, the application of the SSD in contrasting clinical samples, as was done during the concurrent validity testing of the SSD (Chapters 5 - 7), would go



further towards a clearer understanding of which dissociative symptoms are the most typical, and which dissociative symptoms cluster together. Moreover, the use of the SSD to study neurophysiological correlates of dissociation, might elucidate whether the seven symptom categories represent a single construct, or whether various symptom groups correlate with different neurophysiological correlates (Chapters 8 - 10).

#### *4.6.2 The SSD as a state measure of dissociation*

The self-report format and present state wording of the SSD would allow it to measure dissociative experiences at the time that they occur, and therefore to be a state measure of dissociation. These components are discussed briefly, before looking at the next step, i.e. the sensitivity of the SSD to temporal variability.

##### **4.6.2.1 The SSD as a self-report measure**

Despite due attention paid to the potential problems in the use of self-report measures in patients with dissociative disorders (Steinberg et al., 1990; see also Chapter 3, section 3.1.2.1), the SSD was formatted as a self-report measure. In this study, there were no personal consequences for the subject in terms of further treatment and there was, therefore, a reduced risk of the misrepresentation of responses. Moreover, care was taken not to use esoteric language or jargon in the items.

One of the difficulties inherent to dissociation is the subjective nature of many of the symptoms. In particular, mild symptoms can only be recognised via subjective report; they are not necessarily observable by others. Such symptoms can only be rated present if the patient complains of them or endorses them on direct questioning, e.g., during the administration of a scale. Examples of such symptoms that can usually

only be recognised via subjective report are derealisation, depersonalisation, and identity confusion.

The strong point of the SSD as self-report measure lies, therefore, in its ability to pick up these subjective experiences.

However, as the dissociative symptoms become more severe, they may manifest as noticeable clinical signs such as fugue states, stupor, sudden switching among alter personalities (as demonstrated by markedly different speech and behaviour) and paralysis, with a possible reduction in the patient's awareness of these symptoms.

In the presence of severe symptoms, e.g., in dissociative identity disorder, the 'executive alter identity' (the 'available ego' conducting the interview) might be unaware of the existence of the other identities, and also be unaware of the dissociative symptoms associated with other identities. Similarly, a patient who is experiencing an intense flashback cannot control the state s/he is in, and might be unable to complete the SSD. A comparable situation might arise for a severely stuporous patient, who might be unable to complete a self-report measure.

In some of these severe instances a self-report measure might be considered to become an unreliable reflection of the patient's inner experience. Therefore, an important limitation of the self-report format of the SSD is that it might exclude the assessment of severely disturbed patients.

However, the SSD was not constructed for use only in patients with dissociative disorders, but also in other psychiatric patients and in the normal population, where a self-report format would not pose this problem.

#### **4.6.2.2 The SSD as a present-state measure**

The wording of the items selected for inclusion in the SSD was modified in order to focus the scale on the subject's dissociative experiences at the time of completion of the SSD, and to capture the subject's present dissociative state.

However, this brought the limitation that the SSD measures only state dissociation. The SSD cannot, e.g., measure trait dissociation, or past experiences of dissociation. In order to measure trait dissociation or past dissociation, one would have to rely on one of the existing measures of dissociation. Alternatively, other 'trait' or 'past history' versions of the SSD might be developed for those purposes.

The sensitivity of the self-report, present-state SSD to short-term changes in the intensity of dissociative experiences is the next concern.

#### **4.6.2.3 The sensitivity of the SSD to temporal variability**

The SSD was formatted and worded to capture the subject's present dissociative state (section 4.4.2.2). However, such formatting and wording do not guarantee that the SSD would be sensitive to rapid, transient changes in dissociative states. Therefore, an assessment of the sensitivity of the SSD to the temporal variability of dissociative experiences, would depend on the ability of the SSD to pick up momentary (on-off) alterations and short-term changes in the duration (and intensity) of dissociative experiences. The study of this property of the SSD would require a sequential design, with or without experimental induction of dissociative experiences.

Hence, the pilot study of the psychometric validation (Chapter 5, section 5.3) tested the ability of the SSD to measure overnight changes in the dissociative status of nursing staff during a night shift. The further psychometric validation of the SSD (Chapters 5 -7) tested the ability of the SSD to measure a change in the dissociative

status of psychiatric patients and controls after the administration of four psychiatric scales. The study of the EEG correlates of dissociation (Chapters 8 - 10) also tested the ability of the SSD to measure experimentally induced changes in the dissociative status of patients with complex partial epilepsy.

If these studies provided evidence for the sensitivity of the SSD to temporal variability in dissociative status, that would also confirm the ability of the SSD to measure dissociative experiences at the time that they occur, and therefore that the SSD is a true state measure of dissociation.

#### *4.6.3 The SSD as a measure that is sensitive to the intensity of dissociative experiences*

The format of 10 unnumbered boxes retains the benefits of a true visual analogue scale (say, compared to an ordinal scale): sensitively quantifying the intensity of the symptoms (Aiken, 1996), and ensuring the greatest possible freedom of expression of individual variation without forcing the respondent's answer, for example, into fixed descriptions or into one of four specified possible grades of severity. At the same time, this format of unnumbered boxes facilitates the scoring of responses and the entry of data into a computerised data file, and also eliminates otherwise possible hitches in the processing of data from a true visual analogue scale, for example, due to faulty or inaccurate optical scanner operation.

The format of 10 unnumbered boxes was aimed at increasing the sensitivity of the SSD to the intensity of dissociative experiences, so that the SSD would distinguish between milder and more severe dissociative experiences, and would quantify the intensity of dissociation on the continuum between the extremes of intensity. Such sensitivity would also mean the SSD could distinguish people who



dissociate from people who do not dissociate, and thus contribute towards the external criterion-related validity of the SSD (cf. Chapter 3, section 3.3.2.1).

One limitation is that the possible effect of rating errors on the ability of the SSD to measure accurately the intensity of dissociative experiences was not assessed. For example, no assessment was done of the roles of ‘central tendency error’ (the tendency to rate in the middle categories to a greater extent than justified), of the tendency towards selection of the extreme categories, or of ‘proximity error’ (the tendency to assign similar ratings to items that are closer together on the printed page) (Aiken, 1996).

#### *4.6.4 The SSD as a user-friendly scale*

As set out in section 4.4.4 above, the methods of using clear instructions, an uncluttered layout, columns, short and simple phrases, an easy scoring system, and a transparent arrangement of items, would all contribute to meet the objective of user-friendliness for both the subject, and the clinician (or researcher).

An assessment of the user-friendliness of the SSD, and in particular, of the ease of administration, the ease of completion, and the time required for completion of the SSD, would be made during the pilot study to the psychometric validation of the SSD (Chapter 5, section 5.3).

The main limitation to the user-friendliness of the SSD pertains to the subscale for symptoms of identity alteration: Items 25 - 32 were worded in order to pick up subjective experiences of identity alteration. These symptoms are not expected to be common in the general population or even in psychiatric patients who do not suffer from dissociative identity disorder. Patients who suffer from dissociative identity disorder also do not always know (or rarely know) when exactly they are suffering

from symptoms of identity alteration. The wording of items 25 - 32 might appear strange or 'weird' to a person who does not have those experiences.<sup>14</sup>

#### *4.6.5 Psychometric validation of the SSD*

The need for a state scale was addressed by constructing a scale that would measure dissociative experiences at the time that they occur, that would be sensitive to the intensity of dissociation, as well as sensitive to momentary alterations or the short-term variability in the duration of dissociative symptoms, and that would be informed by existing scales rather than be unprecedented.

Some of the objectives for the SSD, such as its sensitivity to the intensity of dissociative experiences, and its user-friendliness, were built into the formatting, wording, scoring, and visual layout of the SSD. However, the success of that process still had to be assessed formally, during the psychometric validation that was carried out in healthy controls and different clinical populations (Chapters 5 - 7).

It remained to be established whether the SSD was a valid and reliable measure of dissociative symptoms. In addition to the results of the content validation and reliability testing of the SSD, the following chapters will contain discussion of the construct validity of dissociation, according to the results of inter-symptom correlations (dissociative symptoms with each other and dissociative symptoms with other symptoms).

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<sup>14</sup> The problem with items 25 - 32 as formulated in this draft version of the SSD, only became apparent at the time of the pilot study (Chapter 5, section 5.3). These items were phrased from the perspective of a single, integrated personality, whereas one of the main difficulties of patients with dissociative identity disorder concerns an inability to integrate the cognitive, affective, and behavioural functions that constitute normal personality. Items 25 - 32 in the draft version of the SSD, would therefore not 'ring true' to a patient who suffers from those experiences. In the subsequent version of the SSD (Chapters 5 - 7) items 25 - 32 were reworded with an even greater bias towards someone who would be suffering from symptoms of identity alteration.

Chapter 5 will concern the derivation of the working version of the SSD through a pilot study aimed at item selection and item revision, and the design and methods of the further psychometric validation of the SSD. Chapter 6 will present the results of the psychometric validation of the SSD, and Chapter 7 will provide a discussion of the psychometric validation of the SSD.

**Table 4.1   SSD content description**

	<b>Subscale</b>	<b>Item numbers</b>	<b>Number of items</b>
1	Derealisation	1 - 8	8
2	Depersonalisation	9 - 16	8
3	Identity confusion	17 - 24	8
4	Identity alteration	25 - 32	8
5	Conversion	33 - 40	8
6	Amnesia	41 - 48 <sup>*</sup>	8
7	Hypermnesia	49 - 58	10

<sup>\*</sup> Items 41 and 42 in this subscale were excluded after the psychometric validation of the SSD (cf. Chapter 6); hence the amnesia subscale consisted of 6 items (41-46) and the hypermnesia subscale consisted of 10 items (47-56).



Table 4.2 Origins of SSD items (a: measures of dissociation)

SSDitem	DPI	DES	PAS	QED	DDIS	HSCL-D	SCID-D	TSI	OMSE
1		★		★		★	★	⊕	★
2		⊕					⊕		
3	★	★							★
4		★				★			
5									
6									
7		★		★		★			
8		★		⊕	★	★			★
9									
10	⊕	★	★	★		★	★		⊕
11	★		★	★	★		★		
12		★		★	★	⊕	★	⊕	⊕
13					⊕		★		
14				★	★		★		
15	★						⊕		
16	⊕								★
17						★		⊕	
18				★					
19				★	★		★	⊕	
20									
21			⊕				⊕		★
22			⊕						★
23		★					⊕		
24		★		★	★		⊕		★
25	★		★		★	★	⊕		★
26							★		★
27		★		★	⊕		★		
28									
29			⊕		⊕		⊕		★
30			★	★	★		★		★
31			★		★			⊕	
32	★		⊕		★		★	★	
33								★	★
34									
35				★			★		
36				★			★		
37									
38								★	★
39								★	★
40				★					★
41			★	⊕		⊕	★	★	★
42		★						★	⊕
43		★	★						★
44						★	★		
45		★		★	★	★			★
46		⊕							★
47									
48		★	★	★	★				★
49		★		★	★				
50									
51					★				
52								⊕	
53								★	⊕
54					★				★
55		★					★		★
56								★	★
57									★
58									★

★: SSD item represents 1 parent scale item; ⊕: SSD item represents 2 or more parent scale items.

Table 4.2 Origins of SSD items (b: more measures of dissociation)

SSDitem	TSC-40	CDAP	KKDMP	DIS-Q	SASRQ	PDEQ	PDS	NCDI	SDQ-20
1	★	★		⊕	★	★	★		
2				★	★				★
3									
4				★					
5									
6									★
7									
8	⊕		★	★					
9				★	★				
10		⊕		⊕	⊕	★			
11		★			★	★			
12	★		⊕			★	★		
13									
14						★			★
15									
16		★		★	★				
17									
18				★					
19			⊕	⊕					
20				⊕					
21			⊕						
22				★					
23			⊕					★	
24			⊕	★			★	★	
25			⊕	⊕					
26			⊕	★					
27		★	⊕	★					
28									
29		★	★	⊕			★	★	
30			★	★			★		
31	★	★		★			★	★	
32			⊕	⊕			★	★	
33			★				★		★
34			★				★		★
35			⊕	★			★		★
36				★			★	★	★
37		★							
38		⊕					★		⊕
39		★		★			★	★	
40			★	★				★	⊕
41				⊕	⊕	★	★	★	
42				⊕		★	★	★	
43		★		★	★	★	★	★	
44	★	★			★	★		⊕	
45		★	★	⊕	★	★	★	★	
46				⊕		★			
47				★	★				
48			⊕	★	★	★			
49									
50									
51									
52		⊕			★				
53			★						
54	★	★							
55		★		★	★				
56									
57									
58									

★: SSD item represents 1 parent scale item; ⊕: SSD item represents 2 or more parent scale items.

Table 4.2 Origins of SSD items (c: other measures)

SSD item	SAPS	SANS	PANSS	CPSLS	PPI	PSE	SCL-90R
1				⊕	★	★	
2				⊕			
3							
4							
5							
6					★		
7							
8				★			
9							
10						★	
11						★	
12						★	
13						★	
14	★		★				
15							
16	★		★			★	★
17							
18							
19							
20							
21							
22							
23						★	
24	★		★		★	★	★
25							
26							
27							
28							
29			★				
30	★		★				★
31							
32				⊕	★		⊕
33			★		★	★	★
34		★	★		★		
35							
36				⊕			
37				★			
38				★		★	★
39							
40						★	
41				⊕	★		★
42		★	★	★			
43							
44	★		★	★			★
45				⊕		★	
46				★			
47			★	★			
48			★	⊕	★		
49				★			
50				★			
51							
52							
53							
54							
55							
56							
57				★	⊕		
58				★			

★: SSD item represents 1 parent scale item; ⊕: SSD item represents 2 or more parent scale items.

# Psychometric validation of the SSD: Pilot study, design, and methods

This chapter recounts the derivation of the working version of the SSD through a pilot study aimed at item selection and item revision, and the rest of the design and methods of the psychometric validation of the SSD. The pilot study formed an integral part of the design and methods of the psychometric validation of the SSD and therefore the pilot study is presented in the same chapter as the rest of the design and methods. The various sections will be presented in the following order: aim of psychometric validation of the SSD (section 5.1); objectives for the psychometric validation (section 5.2); pilot study to the psychometric validation (section 5.3); design of psychometric validation (section 5.4); methods of psychometric validation (section 5.5); anticipated results of psychometric validation (section 5.6).

Because of the similarities between several of the topics in the design and methods of the psychometric validation, and those in the pilot study (which also has design and methods sections), and in order to minimise confusion between the different levels of topics, the headings in this chapter are detailed and indicate whether the material under them concerns the pilot study or the full design and methods for the psychometric validation. The headings and text relating to the pilot study are also presented in a different font, so that they can be distinguished easily from the main body of this chapter, which concerns the design and methods for the psychometric validation of the SSD.



The results of the psychometric validation of the SSD will be presented in Chapter 6, and a discussion of the psychometric validation of the SSD in Chapter 7.

### ***5.1 Aim of psychometric validation of the SSD***

After the SSD had been constructed (Chapter 4), it was psychometrically tested to assess its validity and reliability, and to assess the contribution of the SSD to research on dissociation. A special requirement for the validation of the SSD was that it should be sensitive to the temporal variability of dissociation since it is meant to be a ‘state’ scale of dissociation.

### ***5.2 Objectives for the psychometric validation of the SSD***

To meet the above aim, the objectives of the psychometric testing were formulated as follows:

#### ***5.2.1 Can the SSD measure the severity of dissociative symptoms at the time of completion of the SSD?***

The question whether the SSD measures what it is supposed to measure refers to the validity of the SSD. If the scores obtained after completion of the SSD could distinguish between subjects with mild dissociative symptoms and subjects with severe dissociative symptoms, the SSD would be considered to possess good concurrent validity (cf. Chapter 3, section 3.3.2.1.1).

#### ***5.2.2 Can the SSD predict a diagnosis of a dissociative disorder?***

Going a step further than the first objective, the question arises whether a single individual’s SSD score could be used to predict whether the individual suffers from a dissociative disorder. If the SSD score had such predictive value, the SSD could be

considered a clinically useful test in the diagnosis of dissociative disorders (cf. Chapter 3, section 3.3.2.1.2).

### *5.2.3 Do the symptom groups in the SSD cluster together?*

The lack of consensus, as discussed in Chapter 1 (section 1.2), on which dissociative symptoms are the most typical of the phenomenon brings into question whether all seven symptom groups in the SSD represent a single construct. The statistical procedure of factor analysis (cf. Chapter 3, section 3.3.3.1) would assess the construct validity of the SSD.

In particular, the decision to include conversion symptoms in the SSD could be evaluated by the same process. Factor analysis would show whether conversion symptoms cluster together with the other dissociative symptoms.

### *5.2.4 Examination of the relation between dissociative states as measured by the SSD and other psychiatric symptoms*

As a part of the psychometric validation of the SSD, an objective is to examine the relation between dissociative states as measured by the SSD and other psychiatric symptoms. There are a few possible perspectives to this objective:

#### **5.2.4.1 Does dissociation as measured by the SSD overlap with other constructs?**

The question might be, for example, whether dissociative symptoms represent an independent construct, i.e. separate from other constructs such as depressive symptoms, anxiety symptoms, or psychotic symptoms. The separateness of dissociative symptoms from other psychiatric symptoms can be assessed by performing discriminant validity testing (cf. Chapter 3, 3.3.3.3).

#### **5.2.4.2 Examine the dissociative symptoms present in psychiatric illnesses other than the dissociative disorders**

The results of the application of the SSD in various clinical samples might say something about the presentation of dissociative symptoms in patients who suffer from a variety of psychiatric illnesses. Such results might have epidemiological value.

#### ***5.2.5 Is the SSD distinct from trait measures of dissociation?***

The question whether the SSD (a state measure of dissociation) measures something different from what is measured by trait measures of dissociation would be examined by testing the convergent validity (cf. Chapter 3, section 3.3.3.2) of the SSD in comparison with a trait measure of dissociation.

#### ***5.2.6 Does the SSD measure consistently what it is supposed to measure?***

Reliability testing, and in particular, the testing of the internal consistency (cf. Chapter 3, section 3.4.2) of the SSD would reflect the extent to which it measures consistently, i.e. to what extent SSD and subscale scores are free from errors of measurement.

#### ***5.2.7 Is the SSD sensitive to the temporal variability of dissociation?***

The sensitivity of the SSD to the temporal variability of dissociation refers to the ability of the SSD to pick up momentary (on-off) alterations or the short-term variability in the duration of dissociative symptoms (cf. Chapter 3, section 3.5).

Before embarking on the process of psychometric validation as guided by the above objectives, a pilot study was done in the interests of appraisal and possible revision of

the SSD, and a ‘sneak preview’ of the ability of the SSD to identify people who dissociate and the sensitivity of the SSD to the temporal variability of dissociation. The pilot study also had the additional benefit of highlighting potential problems in the methodology of the psychometric validation.

### ***5.3 Pilot study to the psychometric validation of the SSD***

This section describes the pilot study that provided initial guidance for more comprehensive psychometric validation. The aims, objectives, design, methods, and results of the pilot study are discussed, and the section is concluded by a summary of the implications of this pilot study for revision of the PILOT-SSD and for more comprehensive psychometric validation in the following sections.

#### ***5.3.1 Pilot study: Aims***

This pilot study aimed at selecting and refining those items that would best contribute to a state measure of dissociation. Also, it aimed to test initially the ability of the PILOT-SSD to distinguish between people who do and do not dissociate, to test initially the ability of the PILOT-SSD to pick up short-term changes in the intensity of dissociative symptoms, and to determine whether the SSD is user-friendly. The expectation was also that this pilot study would show up methodological problems that could be addressed subsequently in more comprehensive psychometric validation.

#### ***5.3.2 Pilot study: Objectives***

The objectives of the pilot study of the psychometric validation of the PILOT-SSD flowed directly from the aims:

##### **5.3.2.1 Item selection and revision**

The main objective of this pilot study was item selection and item revision in the PILOT-SSD. The process of item selection and item revision might occur through expert consultation (content validity) and the testing of internal criterion-related validity (cf. Chapter



3, sections 3.3.1 and 3.3.2.2). Items that did not contribute towards a measurement of dissociation would be changed or removed.

#### **5.3.2.2 Initial testing of the ability of the PILOT-SSD to identify people who dissociate**

A further objective was to establish whether the PILOT-SSD could distinguish between people with a high degree of dissociative experiences and people with a low degree of dissociative experiences, through initial testing of the concurrent validity of the PILOT-SSD (cf. Chapter 3, section 3.3.2.1.1).

#### **5.3.2.3 Assessing the user-friendliness of the PILOT-SSD**

It was necessary to establish whether the PILOT-SSD was a user-friendly scale and whether the instructions at the top of the PILOT-SSD were clear and easy to understand (cf. Chapter 3, sections 3.1.2.2 and 3.1.2.3).

#### **5.3.2.4 Initial testing of the PILOT-SSD's sensitivity to temporal variability of dissociation**

Another objective of this pilot study was to test whether the PILOT-SSD could measure a change in the intensity of a person's dissociative experiences from one occasion to another (cf. Chapter 3, section 3.5).

#### **5.3.2.5 Ironing out methodological problems for psychometric validation of the PILOT-SSD**

The pilot study would also serve to identify any methodological problems, for example, relating to data collection or analysis. If any such problems became evident, the design and methods of the further psychometric validation (Chapters 5 - 7) could be altered.

### ***5.3.3 Pilot study: Design***

The design of this pilot study represented an extract from the review of methods to test psychometrically a psychiatric rating scale, as described in Chapter 3.

### **5.3.3.1 Initial validity testing of the PILOT-SSD**

The first three objectives would be met by a process of initial validity testing of the PILOT-SSD.

First, the testing of internal criterion-related validity (cf. Chapter 3, section 3.3.2.2) by examining item-total correlations of the PILOT-SSD, would aid the process of item selection and revision of items that did not appear to contribute to the construct of dissociation (as represented by the 7-tiered framework). Consultation with experts of dissociative disorders, also in the interest of item selection and revision, would contribute to the content validity of the PILOT-SSD (cf. Chapter 3, section 3.3.1).

Second, in order to meet the objective of the testing of the ability of the PILOT-SSD to identify people who dissociate, the external criterion-related validity or concurrent validity (cf. Chapter 3, section 3.3.2.1.1) of the PILOT-SSD would be tested in two contrasting groups of people: a sample of healthy control subjects and a sample of psychiatric patients known to experience prominent dissociative symptoms.

Third, the objective of determining whether the PILOT-SSD is user-friendly, would be met by observing and recording the behaviour of subjects during completion of the PILOT-SSD, and by enquiring about their responses and their experience of the questionnaire and any problems during its completion. In addition to assessing the user-friendliness of the PILOT-SSD, these enquiries from subjects would contribute towards the testing of construct validity (cf. Chapter 3, section 3.3.3.4).

### **5.3.3.2 Initial reliability testing of the PILOT-SSD**

The first objective of item selection and revision of items that did not appear to contribute to the construct of dissociation (as represented by the 7-tiered framework), would also be met in part by a process of initial reliability testing of the PILOT-SSD. If any items turned out to be redundant statistically, they could be revised or discarded from the PILOT-SSD. Initial reliability testing would also assess the ability of the PILOT-SSD to measure whatever it measures, consistently (cf. Chapter 3, sections 3.4.1 and 3.4.2.).

### **5.3.3.3 Test for overnight changes in dissociative status**

In order to meet the objective of initial testing of the sensitivity of the PILOT-SSD to temporal variability of dissociation, the PILOT-SSD would be administered twice to the same group of people (on consecutive days), and the association between the two sets of results tested (cf. Chapter 3, section 3.5.1).

### **5.3.4 Pilot study: Methods**

This section on the methods used in the pilot study to the psychometric validation of the PILOT-SSD starts by describing the subjects who participated, and the instruments and procedure used in the pilot study. Then the section on the methods of analysis will be introduced by a review of the data processing and software used in the pilot study, and the methods for the descriptive statistics and obtaining results in terms of confidence intervals. The methods of analysis for the initial validity and reliability testing of the PILOT-SSD, and for the testing for temporal variability, conclude this section.

The methods of analysis for the initial validity and reliability testing, and for the testing for temporal variability (by testing for overnight changes in dissociative status) are summarised in Figure 5.1.

#### **5.3.4.1 Pilot study: Subjects**

The subjects who participated in the pilot study came from two contrasting populations, psychiatric patients and healthy controls. Inclusion and exclusion criteria, and ethical considerations are discussed.

##### **5.3.4.1.1 *Samples from two populations***

A sample of healthy control subjects and a sample of psychiatric patients known to experience prominent dissociative symptoms, participated in the pilot study.

First, the PILOT-SSD was administered to 22 members of nursing staff at South Warwickshire General Hospital - the healthy control group. These control subjects were considered unlikely to have a tendency to experience prominent dissociative symptoms on a regular basis, yet their sleep deprivation during night shifts represents a known precipitant of dissociative experiences.

Second, the PILOT-SSD was administered to a clinical population of 10 psychiatric inpatients known to experience prominent dissociative symptoms within their respective illnesses.

#### **5.3.4.1.2      *Inclusion criteria***

The control group consisted of members of nursing staff from any designation who were working a night shift on the medical or surgical wards, at the South Warwickshire General Hospital, on 19 July 1996.

The clinical group consisted of inpatients at St. Michael's Hospital (a psychiatric hospital) during the period July - August 1996, who had been admitted for longer than 3 days, and who were known to experience prominent dissociative symptoms as a part of their illness, regardless of their diagnosis.

#### **5.3.4.1.3      *Exclusion criteria***

Excluded from the control group, were persons with a reported history of psychiatric treatment, and persons taking regular prescribed psychoactive medication.

Where the participation in the study of clinical subjects appeared clinically contra-indicated from discussion with their responsible consultant psychiatrist, the patient was excluded from the clinical group.

#### **5.3.4.1.4      *Ethical considerations***

Research ethics approval for this and all other parts of the research described in this thesis, was obtained from the Warwickshire Research Ethics Committee, the Coventry Research Ethics Committee, and the Maudsley Hospital Research Ethics Committee. An information and consent form similar to the one used in the further psychometric validation (Appendix 2) was given to each subject, according to the regulations of the research ethics committees.

#### **5.3.4.2 Pilot study: Instruments**

The PILOT-SSD, a 58-item version of the State Scale of Dissociation, a self-report questionnaire consisting of 7 subscales (described in Chapter 4), was administered. This



was a draft version of the SSD. The PILOT-SSD was revised after this pilot study, after which the final working version of the SSD was used in the further psychometric validation.

In addition to the 58 items constituting the PILOT-SSD, the questionnaire used in this pilot study contained 4 questions, with space left for the respondent to record their answers, covering the following subject areas: whether or not they found the completion of the PILOT-SSD upsetting, any regular medications taken, psychiatric history, and substance use during the previous month.

#### **5.3.4.3 Pilot study: Procedure**

The procedure that was followed differed between the control group and the clinical group.

##### **5.3.4.3.1 *Pilot study: Procedure for control subjects***

The PILOT-SSD was administered to the control subjects twice: shortly after starting a night shift and again shortly before ending the same night shift. The members of the nursing staff were approached on the medical and surgical wards, between 10.30 pm and 11.30 pm (i.e. shortly after the start of their night shift), on 19 July 1996. An explanation was given about the study, and their voluntary participation was invited. Upon agreement, each person was handed an envelope containing two copies of the PILOT-SSD, with the request to complete the first copy immediately or as soon as possible, and to complete the second one immediately before the end of the same night shift early the next morning. The time of completion of the PILOT-SSD was requested at the top of each questionnaire. The questionnaires were collected between 06.00 am and 06.30 am on 20 July 1996 (i.e. shortly before the end of that same night shift).

##### **5.3.4.3.2 *Pilot study: Procedure for clinical subjects***

A procedure such as the one followed for the control group, with the administrations of the PILOT-SSD at night, clearly would not be in the interest of the clinical group's convalescence. The clinical subjects therefore only completed the PILOT-SSD once, during the usual daylight hours.

The procedure for the psychiatric patient group was as follows: During the period July - August 1996, 10 inpatients at St. Michael's Hospital, who fulfilled the inclusion and exclusion criteria, were approached. After an explanation of what the study was about, their voluntary participation was invited. Upon their agreement and written informed consent, they were handed a copy of the PILOT-SSD to complete there and then. This took place in one of the interview rooms on the wards in St. Michael's Hospital.

#### **5.3.4.4 Pilot study: Methods of analysis**

##### **5.3.4.4.1 *Pilot study: Data processing and software used***

The data (scores ranging from 0 to 9, for each of the 58 items of the PILOT-SSD for each subject) were entered into a spreadsheet in Microsoft Excel for Windows 95 (version 7.0, 1985-1995), then imported into SPSS for Windows (Statistical Package for the Social Sciences, Release 7.0, 1989-1995), and saved as an SPSS data file. Each variable was defined. New variables were defined for each PILOT-SSD subscale, that is for derealisation, depersonalisation, identity confusion, identity alteration, conversion, amnesia, and hypermnesia. Each of these subscale scores was computed as the sum of its component item scores.

For example: "Derealisation raw score" = score (item 1) + score (item 2) + .... + score (item 8).

The raw score of each subscale was then also converted to a percentage score in the following way:

For example: "Derealisation percentage score" = "derealisation raw score" ÷ 72 × 100, where 72 = 8 (number of items in this subscale) × 9 (maximum score for each item).

In the same way, a new variable, "Total PILOT-SSD raw score", was computed as the sum of all 58 item scores. This raw score was also converted to a percentage score, in the same way as above:

"Total PILOT-SSD percentage score" = "Total PILOT-SSD raw score" ÷ 522 × 100, where 522 = 58 (total number of items in the PILOT-SSD) × 9 (maximum score for each item).

Note that this method of computing "raw scores" and "percentage scores" was replaced in the rest of the psychometric validation of the PILOT-SSD, and in the study of the EEG correlates of dissociation, with the computation of mean scores for each subscale and for the entire PILOT-SSD.

#### **5.3.4.4.2      *Pilot study: Methods of descriptive statistics***

The descriptive statistics would be used to meet the first objective of the pilot study - that of item selection and revision.

##### **5.3.4.4.2.1      Mean item scores and standard deviations**

The items with a low mean score were selected for revision, because of their 'drag effect' on the mean total PILOT-SSD score, and in order to increase the sensitivity of the scale. From the items that showed a low mean score across the three grouping conditions (clinical group, control group - evening, and control group - early morning), those were selected that also showed a higher standard deviation, because their increased variability might reflect a difficulty in comprehension or a non-specific experience.

##### **5.3.4.4.2.2      Median item scores**

The items with the lowest median scores were selected for revision, in order to increase their sensitivity to dissociative experiences.

#### **5.3.4.4.3      *Pilot study: Methods of confidence intervals***

The 95% confidence intervals for each item score, clustered by subgroup, would aid item selection and revision (the first objective of the pilot study). Those items with low mean scores and large confidence intervals were selected for revision, because their variability might reflect a difficulty in comprehension or a non-specific experience.

#### **5.3.4.4.4      *Methods of initial validity testing of the PILOT-SSD***

To reiterate what was said under the design of the pilot study (section 5.3.3.1), the first three objectives of the pilot study would be met by a process of initial validity testing of the PILOT-SSD.

#### **5.3.4.4.4.1 Item-total correlations**

First, the testing of internal criterion-related validity (cf. Chapter 3, section 3.3.2.2) by examining item-total correlations of the PILOT-SSD would aid the process of item selection and revision of items that did not appear to contribute to the construct of dissociation (as represented by the 7-tiered framework).

Scatterplot matrices of the correlations of each item with its subscale percentage score and each item with the total PILOT-SSD percentage score were performed. The correlations of each item with its subscale percentage score and each item with the total PILOT-SSD percentage score were then calculated using the non-parametric Spearman's  $\rho$  (rho) rank correlation coefficient, which does not specifically assess linear association, but rather general association. The correlation coefficients were calculated for the total population, for the patients, and for the control group.

#### **5.3.4.4.4.2 External validity of the PILOT-SSD**

External validity (cf. Chapter 3, section 3.3.2.1.1) refers to the ability of the PILOT-SSD to distinguish or identify correctly whether a person belongs to the control group or to the patient group who are known to experience prominent dissociative symptoms. This ability of the PILOT-SSD was visually displayed by boxplots (summary plots based on the median, quartiles, and extreme values of the relevant distributions). The difference between the control group and the patient group was then tested using the Mann-Whitney U test.

#### **5.3.4.4.4.3 Determining whether the PILOT-SSD is user-friendly**

The objective of determining whether the PILOT-SSD is user-friendly would be met by observing and recording the behaviour of subjects during completion of the PILOT-SSD, and by enquiring about their responses and their experience of the questionnaire and any problems during its completion. In addition to assessing the user-friendliness of the PILOT-SSD, these enquiries from subjects would contribute towards the testing of construct validity (cf. Chapter 3, section 3.3.3.4).



#### **5.3.4.4.5      *Methods of initial reliability testing of the PILOT-SSD***

The first objective of item selection and revision of items that do not appear to contribute to the construct of dissociation (as represented by the 7-tiered framework) would also be met in part by a process of initial reliability testing of the PILOT-SSD. If any items turned out to be redundant statistically, they could be revised or discarded from the PILOT-SSD. Initial reliability testing would also assess the ability of the PILOT-SSD to measure whatever it measures, consistently. (Cf. Chapter 3, sections 3.4.1 and 3.4.2.)

##### **5.3.4.4.5.1      Item-item correlations**

Scatterplot matrices and matrices of the Spearman's  $\rho$  (rho) rank correlation coefficients of each item with each other item were done simultaneously with the item-total scatterplot matrices and correlation matrices of section 5.3.4.4.4.1 above. These scatterplot matrices and correlation matrices were done for each set of subscale items in turn, and for each population in turn (total population, patients, and control group). The aim might have been to identify highly correlated item pairs, where one of the pair might be considered redundant. However, the plan to keep the PILOT-SSD made up of paired items (as explained in Chapter 4) created the expectation of a moderate to high correlation between each item and its mate, and therefore obviated the need to intervene in the case of highly correlated item pairs.

##### **5.3.4.4.5.2      Internal consistency**

Cronbach's alpha reliability coefficient, based on the average covariance among items, is also a measure of the internal consistency of a scale.

##### **5.3.4.4.5.3      Split-half reliability**

For the testing of split-half reliability, the PILOT-SSD items were split into two parts (two groups of 29 items each) and the correlation between the two parts calculated, based on the total population.

#### **5.3.4.4.6      *Methods of testing for overnight changes in dissociative status***

In order to meet the objective of initial testing of the PILOT-SSD's sensitivity to temporal variability of dissociation, the PILOT-SSD was administered twice to the control group of subjects (overnight). The ability of the PILOT-SSD to measure a change in the intensity of dissociative symptoms after a night shift was visually represented in the form of boxplots. Subsequently, the association between the two sets of results was tested (cf. Chapter 3, section 3.5.1) by computing the correlations between the total PILOT-SSD percentage scores of the control group on the two occasions (evening and morning). The correlation coefficients give an indication of the stability of the scores over time, and therefore of the sensitivity of the PILOT-SSD to the temporal variability of dissociative experiences.

### **5.3.5 *Pilot study: Results***

This section on the results of the pilot study will be introduced by the demographic information of the subjects, the descriptive statistics, and confidence intervals. The three main aspects of the design of the pilot study, i.e. initial validity and reliability testing of the PILOT-SSD, and the testing for overnight changes in dissociative status will follow. This section will be concluded with the methodological problems that were encountered in this pilot study.

#### **5.3.5.1 Pilot study: Demographic information**

Table 5.1. summarises the ICD-10 diagnoses of the inpatients. Patients suffering from these illnesses (other than the dissociative disorders themselves) often also have dissociative symptoms as a part of their illness.

The patients received the following regular medications (with the number of patients taking such medication in brackets): anticonvulsants (2), neuroleptics (4), antidepressants (3), anticholinergics (3), analgesics (1), medication for asthma (1), laxatives (1), anticoagulants (1), hypnotics (3). Two patients reported a history of brain damage, and they suffered from epilepsy. One of the control subjects also reported a head injury 26 years previously, caused by a brick, that resulted in a retinal haemorrhage but no skull fracture.

Psychiatric history: The mean length of time since the patients' first contact with the mental

health services was 5.3 years. Gender: The 22 members of nursing staff were all female; of the 10 patients, 8 were female.

Frequency of psychoactive substance use during the last month: Of the patients, 4 (40%) reported having used alcohol during the previous month, and 1 (10%) reported having used cannabis during the previous month. Of the members of nursing staff, 17 (77.3%) reported having used alcohol during the last month, and none reported the use of another psychoactive substance during the last month. No respondent was under the influence of alcohol or another psychoactive substance at the time of completion of the questionnaires.

Five of the control subjects (22.7%) reported being upset by some of the PILOT-SSD items, and one person who was not upset at the first PILOT-SSD, became upset by the second PILOT-SSD. Five of the patients (50%) were upset by some of the items; of these, 2 suffered from a dissociative disorder and 3 suffered from another disorder (that is, 66.7% of the patients with a dissociative disorder and 42.9% of the patients with other disorders were upset).

On the whole, it took patients and control subjects 3 to 8 minutes to complete the PILOT-SSD, depending on their degree of psychomotor agitation or retardation. No problems were experienced with the intelligibility of the PILOT-SSD; neither control subjects nor patients needed to clarify the meaning of any items. After direct questioning about their experience relating to completion of the PILOT-SSD and about factors contributing to their responses on the PILOT-SSD, nothing emerged that could be seen as an interfering or confounding factor concerning their responses.

The mean period between the completion of the evening PILOT-SSD and the completion of the morning PILOT-SSD (control group) was 5½ hours.

### **5.3.5.2 Pilot study: Results of descriptive statistics**

#### **5.3.5.2.1 *Mean item scores and standard deviations***

The mean item scores and standard deviations were computed and shown in ascending order, for the total population, for the patients, and for the control group (Table 5.2). In the

control group, 11 of the items were scored as 0 by all the respondents. The following items were selected for revision: 6, 12, 19, 26, 28, 30, 40, 45, 46, 48, 50, 57, 58.

#### **5.3.5.2.2      *Median item scores***

Figure 5.3 shows bar charts of the median scores of individual items in the patient group, where the subscale and its items are represented, each on its own mini-chart. The same was not meaningful for the control group, because their median item scores were often zero. From these bar charts, the following items were selected for revision: 6, 14, 28, 30, 37, 40, 46, 50.

#### **5.3.5.3 Pilot study: Results of confidence intervals**

Figure 5.2 shows the 95% confidence intervals for each item, clustered by subgroup. The following items were selected for revision: 6 (low mean with wide confidence interval in patients and zero scores in controls); 14 (high mean and wide confidence interval in controls and low mean in patients); 28, 37, 46, and 50 (low mean scores and wide confidence intervals in the patient subgroup).

#### **5.3.5.4 Results of initial validity testing of the PILOT-SSD**

##### **5.3.5.4.1      *Item-total correlations***

Scatterplot matrices provided the initial visual impression that most of the items correlated well with their subscale percentage scores, and that they correlated less well with the total PILOT-SSD percentage score. Also, it was clear that each subscale percentage score correlated well with the total PILOT-SSD percentage score. These scatterplot matrices were done for each set of subscale items in turn, and for each population in turn (total population, patients, and control group). The visual impression was that the correlations in the patient and control groups were less marked.

The full Spearman's rho correlation matrix for the total population showed that the items correlated highly with their own subscale percentage scores (coefficients varied between  $\pm 0.65$  and  $\pm 0.95$ , with all of these significant at the 0.01 level), and that each subscale percentage score correlated well with the total PILOT-SSD percentage score



(coefficients varied between  $\pm 0.60$  and  $\pm 0.83$ , with all of these significant at the 0.01 level). The correlation matrices for the patients and the control group showed similar results. Table 5.3 summarises the correlation coefficients of all item - total PILOT-SSD percentage score pairs, for the whole population, the control group, and the patient group. Correlation coefficients could not be computed for the following items in the control group, and therefore values corresponding to these items are missing in the table: items 13 and 15 (for each of these items only one person scored  $> 0$ ; one person scored 1 on item 13 and a different person scored 3 on item 15); also items 6, 12, 19, 26, 28, 40, 45, 46, 48, 57, 58 (all respondents scored 0 on these items). Correlation coefficients  $\leq .267$  are highlighted in bold type in Table 4.3, and the corresponding items (6, 7, 21, 24, 25, 27, 30, 33, 37, 41, 48, 57, and 58) were considered for possible revision on the grounds of not contributing to the total PILOT-SSD score. However, some of these items correlated highly in one or both of the other groups and, as a consequence, items 6, 24, 25, 30, 48, 57, and 58 were identified as those most in need of revision.

#### 5.3.5.4.2 *External validity of the PILOT-SSD*

In Figure 5.4 the box represents the interquartile range of item scores, which contains the middle 50% of values. The whiskers are lines that extend from the box to the highest and lowest values, excluding outlying values. A line across the box indicates the median score. The Mann-Whitney test shown in the second table below the boxplot in Figure 5.4, represents the estimated probability (significant at the 0.001 level) that a new score observation from the control population will be less than a new score observation sampled from the patient population.

#### 5.3.5.4.3 *User-friendliness of the PILOT-SSD*

Respondents reported no difficulties during the filling in of the PILOT-SSD, and observation of their behaviour during the filling in (in the patient group) did not suggest that they had any difficulty understanding the written instructions or any difficulty in completing the PILOT-SSD. It took the patients about 3 to 10 minutes to complete the questionnaire.

### **5.3.5.5 Results of initial reliability testing of the PILOT-SSD**

#### **5.3.5.5.1      *Item-item correlations***

The visual impression from the scatterplot matrices was that the items correlated less well with each other than they did with their subscale percentage scores or the total PILOT-SSD percentage score. Also, the high correlation coefficients between the items in the full Spearman's rho correlation matrix for the total population support the internal consistency of the PILOT-SSD.

#### **5.3.5.5.2      *Internal consistency***

The Cronbach's alpha coefficient was nearly perfect at 0.99, based on the total population. When each of the items was deleted in turn, the Cronbach's alpha remained >0.99 every time.

#### **5.3.5.5.3      *Split-half reliability***

The Guttman split-half reliability coefficient was 0.98; the equal-length Spearman-Brown coefficient was 0.99; Cronbach's alpha for part 1 was 0.98 and for part 2 was 0.98.

### **5.3.5.6 Results of testing for overnight changes in dissociative status**

From the boxplots in Figure 5.5 it is evident that the median total PILOT-SSD percentage score increased, and both the interquartile range and total range expanded between the beginning and end of the night shift (indicated as "pm" and "am" respectively on the X-axis). The first table below the boxplots demonstrates the change overnight of the mean and standard deviation of the total PILOT-SSD percentage score. In this case, the mean and standard deviation appear to provide a better appreciation of the magnitude of change.

The correlation between the evening and morning scores of the control subjects is shown in the second table below the boxplots in Figure 5.5. The Kendall's tau correlation coefficient was not significant at the 0.05 level, indicating that the total PILOT-SSD percentage scores did not remain significantly stable between the evening and morning measurements.

### **5.3.5.7 Methodological problems in the pilot study**

#### **5.3.5.7.1 *Missing data***

The design was such that the control subjects completed the PILOT-SSD in their own time, and there had been no specific request to ensure that they completed all items. The clinical subjects completed the PILOT-SSD in the presence of the investigator, but here too they were not explicitly requested to complete all items. The result was that several subjects did not complete one or even a few of the items.

These omissions created problems in the analysis of the data. Rather than substituting the series mean or the mean of the neighbouring points, the data were analysed with missing values. In a few instances, a second trial analysis with missing values replaced by the mean of neighbouring data did not yield substantially different results from the analyses with missing data. The analyses were completed with the missing values.

#### **5.3.5.7.2 *Data processing and software problems***

The text nature of several variables such as demographic information and the additional questions at the back of the PILOT-SSD complicated the importation of the data file from the Microsoft Excel package to the SPSS software. In addition, the method of computing “raw” and “percentage” scores was also found to be cumbersome and yielded no more useful information than the computation of mean scores would have done.

### **5.3.6 *Pilot study: Discussion***

The pilot study will be discussed according to the objectives set at the beginning of the section on the pilot study (section 5.3.2), viz. item selection and revision, the ability of the PILOT-SSD to identify people who dissociate, the user-friendliness of the PILOT-SSD, the initial evidence for the sensitivity of the PILOT-SSD to temporal variability of dissociation, and the ironing out of methodological problems for the further psychometric validation of the PILOT-SSD.

### **5.3.6.1 Discussion: Item selection and revision**

The correlation matrices (item-total and item-item) provided more useful information than the scatterplot matrices, mainly because the sample sizes, especially those of the patients, did not allow for the emergence of striking visual patterns. These correlation matrices provided initial support for the internal criterion-related validity of the PILOT-SSD.

The high Cronbach's alpha coefficient and split-half reliability coefficients, as well as the high item-item correlation coefficients, supported the internal consistency of the PILOT-SSD, i.e. the ability of the PILOT-SSD to measure whatever it measures, consistently.

The items indicated under the results above were revised. Usually the revision meant rewording the same experience in a more specific and simpler way. Moreover, to increase the "state" status of the PILOT-SSD, the present continuous tense was enforced in all items, either by explicit formulation, or by the choice of wording.

Revision was further aided by rewording items 25 to 32 (identity alteration) according to "multiples' language" (the "language" that patients with multiple personality disorder use); in other words those items were reworded from a perspective that might be more accessible to all alter identities, including non-executive alters such as a normally hidden alter child identity. Experts in the treatment of patients with dissociative disorders were consulted about the suitability of the reworded items (and the items that were retained as they were) for the assessment of patients with mild to severe grades of dissociative symptoms (see Acknowledgements).

These revisions resulted in a new version of the SSD (Appendix 3) - which is considered better suited to its purpose - ready for use in the further psychometric validation (covered in the rest of this chapter and in Chapters 6 - 7).

The revisions also demonstrate how clinical decision making influences the construction of a scale. For example, clinical experience determines how the items on identity alteration could be rephrased in order to be more sensitive to the symptoms of patients who suffer from dissociative disorders; and at the same time, clinical judgement determines whether the resultant increase in specificity, such that mild experiences in the general population would no longer be measured, is considered acceptable.



### **5.3.6.2 Discussion: The PILOT-SSD can identify people who dissociate**

Although the patient group was heterogeneous with regard to file diagnosis, the clinical observation of prominent dissociative symptoms in this sample was borne out in these results, as reported under section 5.3.5.4.2 above and illustrated in Figure 5.4.

The external validity of the PILOT-SSD was supported by its ability to distinguish whether a person belongs to the control group or to the patient group, on the basis of the significant difference between the distributions of the two groups (Figure 5.4).

One limitation here is that the patient sample was so small. Of the 10 patients, 6 omitted a response to at least one item. Their missing data excluded them from the analysis (cf. sections 5.3.5.7.1), leaving only 4 patients' data for comparison with those of the control subjects. As discussed below under section 5.3.6.5, this problem was addressed in the further psychometric validation of the PILOT-SSD (later in this chapter, and Chapters 6 - 7).

The additional question about psychoactive substance use was asked in order to assess whether dissociative symptoms might be associated more with the use of certain psychoactive substances such as cannabis or hallucinogens. However, the low response rate to most of the substances precluded such an investigation. Also, the specified time period of "during the last month" was too wide to allow for meaningful assessment of a relationship between substance use and dissociative symptoms.

### **5.3.6.3 Discussion: The user-friendliness of the PILOT-SSD**

The questions to individuals about their responses yielded no reason to doubt the user-friendliness of the PILOT-SSD, or to doubt the construct validity of the PILOT-SSD (the third component of the initial validity testing indicated in Figure 5.1).

The short period required for completion of the PILOT-SSD (3-8 minutes) boosts its user-friendliness, but even more importantly, makes it well suited to the measurement of rapidly changing dissociative states, whether these occur naturally or whether they are experimentally induced (as described in Chapters 8 - 10).

The proportionately higher number of patients with a dissociative disorder who were upset by some of the items is expected, since a reminder in the form of a questionnaire, of

their symptoms and of traumatic memories, and the challenge to their defence mechanisms, can be an unpleasant experience.

#### **5.3.6.4 Discussion: Initial evidence for the sensitivity of the PILOT-SSD to temporal variability of dissociation**

Figure 5.5 demonstrated the ability of the PILOT-SSD to measure a change in the intensity of dissociative experiences over a 5½ hour period during a night shift: The low, non-significant Kendall's tau correlation coefficient between the evening and morning PILOT-SSD scores indicates the lack of association between those two sets of scores, and therefore the lack of stability over that time period - a strong point for a state scale.

However, the method of testing the association between scores on two occasions, and interpreting a lack of association as an indication of sensitivity to temporal variability, is not without problems (cf. Chapter 3, section 3.5.1). The conditions at the first and second administration of the PILOT-SSD were identical (apart from the time of the night), and there was no experimental intervention aimed specifically at altering the intensity of dissociation. Therefore, the scores at the 2 administrations of the PILOT-SSD might have been anticipated to correlate highly, and such an association would not necessarily have meant that the PILOT-SSD is not sensitive to the temporal variability of dissociation.

An alternative method - the testing of the difference between the two sets of scores, where the implication of a statistically significant difference in scores is taken to show that the scale scores change significantly within the specified period of time (and therefore that the scale is sensitive to temporal variability) (cf. Chapter 3, section 3.5.3) - was therefore used in the further psychometric validation of the PILOT-SSD (the rest of this chapter and Chapters 6 -7).

The mean overnight period of 5½ hours between the first and second completion of the PILOT-SSD by the control subjects gains meaning if the activities during that night shift are considered: The elements of exhaustion, sleep deprivation, and some disorientation in time (depending on how long the individual had been doing those shifts) may contribute to a higher incidence and intensity of dissociative experiences. In addition, the exposure of the

control subjects to (and their participation in) events that are traumatic to the patients being cared for by the control subjects, may elicit dissociative responses.

As mentioned earlier, such an "awake overnight" procedure is undesirable in the patient sample. However, it would become necessary during the further psychometric validation also to test the sensitivity of the SSD to temporal variability in clinical populations (the rest of this chapter and Chapters 6 -7).

#### **5.3.6.5 Discussion: Ironing out methodological problems for psychometric validation of the SSD**

The methodological problems that were identified during the course of this pilot study mainly concerned data collection and the processing of the data.

The problems relating to missing data, referred to under section 5.3.5.7.1 above, led to explicit requests during data collection for the further psychometric validation, for subjects to complete all items.

The problems experienced with the importation of the data from Microsoft Excel to SPSS were avoided in the further psychometric validation of the SSD by creating the variables in such a way that only numeric values were used.

The method of computing "raw" and "percentage" scores was cumbersome and unnecessary, and was replaced in the rest of the psychometric validation with the usual computation of mean scores for each subscale and for the entire SSD.

#### ***5.3.7 Pilot study: Conclusions and implications for the SSD and its further psychometric validation***

This pilot study demonstrated the methodological problems relating to the computation of total scores and the problems surrounding missing values. However, it represents useful initial validation and reliability testing of the SSD, and it demonstrates already that the SSD is a state measure. Also, this pilot study provides an initial demonstration that the SSD measures what it is supposed to measure, and that it is user-friendly.

The validity and reliability testing identified several items that did not contribute significantly towards a measurement of dissociation. These items were selected for revision,

which entailed rewording in order to increase their sensitivity to measure dissociative symptoms. No items were removed as the revisions were thought to address adequately the problems that appeared during this pilot study. The revisions resulted in a new version of the SSD (Appendix 3) - ready for use in the further psychometric validation (the rest of this chapter and Chapters 6 - 7).

## ***5.4 Design of psychometric validation of the SSD***

After the appraisal of the SSD that was afforded by the pilot study, and the revision of the items as discussed (section 5.3.6.1), the remaining psychometric validation of the SSD could be designed, guided by the objectives formulated in section 5.2, and bearing in mind the methodological problems encountered in the pilot study (section 5.3.6.5).

Figure 5.6 outlines the design for the further psychometric validation of the SSD. This integrated approach to psychometric validation was fully explained in Chapter 3 (A review of methods to develop and test psychometrically a psychiatric rating scale). Note that the SSD undergoing the psychometric validation is the final working version, which was the result of the pilot study (section 5.3).

### ***5.4.1 Validity testing of the SSD***

The first two objectives for the psychometric testing of the SSD would be met by criterion-related validity testing: The testing of concurrent validity (cf. Chapter 3, section 3.3.2.1.1) would examine the ability of the SSD to measure the severity of dissociative symptoms at the time of completion of the SSD. The testing of the predictive validity (cf. Chapter 3, section 3.3.2.1.2) would examine whether the SSD could predict a diagnosis of a dissociative disorder. For both of these ways of testing external criterion-related validity, the SSD would need to be administered in



contrasting clinical samples. Figure 5.7 outlines the design for the testing of criterion-related validity.

Various kinds of construct validity would address the next three objectives: Internal factor analysis (cf. Chapter 3, section 3.3.3.1) would determine whether the symptom groups in the SSD cluster together. Discriminant validity testing (cf. Chapter 3, section 3.3.3.3) would examine the relation between dissociative states as measured by the SSD and other psychiatric symptoms. For this purpose measures of other psychiatric symptoms, such as the Beck Depression Inventory (BDI), the Beck Anxiety Inventory (BAI), and the Positive and Negative Syndrome Scale (PANSS), would need to be administered alongside the SSD. Convergent validity testing (cf. Chapter 3, section 3.3.3.2) would assess whether the SSD is distinct from trait measures of dissociation. For the testing of convergent validity, another measure of dissociation such as the Dissociative Experiences Scale (DES) would need to be administered more or less at the same time as the SSD. Figure 5.8 outlines the design for the testing of construct validity.

#### *5.4.2 Reliability testing of the SSD*

The testing of the internal consistency of the SSD (one kind of reliability testing - cf. Chapter 3, section 3.4.2) would meet the objective of assessing whether the SSD measures consistently what it is supposed to measure. The design for reliability testing of the SSD is outlined on the right-hand side of Figure 5.6.

### ***5.4.3 Testing of the sensitivity of the SSD to temporal variability of dissociation***

The sensitivity of the SSD to the temporal variability of dissociation refers to the ability of the SSD to pick up momentary (on-off) alterations or the short-term variability in the duration of dissociative symptoms. The ways of assessing this ability of the SSD have been covered already in Chapter 3 (section 3.5). The design for the testing of the sensitivity of the SSD to temporal variability of dissociation is outlined in Figure 5.10. The SSD would need to be administered to the same subjects on two different occasions.

## ***5.5 Methods of psychometric validation of the SSD***

The methods for the psychometric validation of the SSD concern the subjects, the instruments, the procedure, and the analysis. The section on design above (section 5.4) corresponds to the main headings under the analysis of the psychometric validation of the SSD.

### ***5.5.1 Subjects for psychometric validation of the SSD***

Psychiatric patients and control subjects participated in the psychometric validation of the SSD. After a brief motivation of the relevance of each psychiatric illness represented in the psychometric validation of the SSD, the study populations for the psychometric validation of the SSD are described. Specific inclusion and exclusion criteria for the study samples follow, and the section is concluded with a reference to ethical issues in the psychometric validation of the SSD.

### **5.5.1.1 Psychiatric illnesses relevant to the psychometric validation of the SSD**

#### **5.5.1.1.1 *Dissociative disorder***

Patients suffering from dissociative disorders were included as a criterion group, as it was anticipated that these patients would show the highest prevalence and severity of dissociative symptoms.

#### **5.5.1.1.2 *Major depressive episode***

Dissociative symptoms may occur during a depressive episode. Moreover, depressive symptoms or disorders often occur comorbidly with dissociative disorders (APA, 1994). In order to distinguish between the above groups, it was thought that a sample of patients suffering from a “pure” major depressive episode without significant comorbid pathology would provide a contrasting sample to the patients with dissociative disorders.

#### **5.5.1.1.3 *Schizophrenia***

Dissociative symptoms may occur in patients with schizophrenia or other psychotic illnesses (APA, 1994), and patients with dissociative disorders often experience hallucinations or other positive symptoms of psychosis (Rosenbaum, 1980; Kluft, 1987; Fink & Golinkoff, 1990; Gainer, 1994; Steinberg et al., 1994; Ellason & Ross, 1995; Offringa & Goff, 1995). To try and account for some of the differences between dissociation and psychosis, it was thought that a sample of patients suffering from schizophrenia would provide a contrasting sample to the patients with dissociative disorders.

#### **5.5.1.1.4      *Alcohol withdrawal***

Dissociative symptoms may occur in patients with alcohol and other substance-abuse-related problems (Dunn et al., 1993; Hodgins et al., 1996; Wenzel et al., 1996), and patients with dissociative disorders have an elevated rate of alcohol or other substance misuse (Cardena & Spiegel, in Michelson & Ray, 1996). To try and account for the differences between dissociation and the physiological effects of alcohol and alcohol withdrawal, a sample of patients suffering from alcohol withdrawal without significant comorbid pathology would provide a contrasting sample to the patients with dissociative disorders.

#### **5.5.1.2 The study populations for the psychometric validation of the SSD**

a) Patients who fulfilled the DSM-IV criteria for a major depressive episode or schizophrenia were identified among all consecutive admissions to the acute admission wards at St Michael's Hospital, the inpatient treatment facility of the South Warwickshire Mental Health Services NHS Trust, between December 1996 and April 1997.

b) Patients with treatment-resistant schizophrenia, who were still suffering from symptoms of the active phase of schizophrenia, despite a longer-term admission in the rehabilitation ward (Rosewood Terrace at St. Michael's Hospital), were also included in the study.

c) Patients who were admitted to the Woodleigh / Beeches Unit, the inpatient facility for the treatment of alcohol and other psychoactive substance-misuse-related disorders of the South Warwickshire Mental Health Services NHS Trust, between December 1996 and April 1997, and who fulfilled the DSM-IV criteria for alcohol withdrawal, were included in the study.



d) Patients who fulfilled the DSM-IV criteria for a dissociative disorder were identified from all consecutive admissions to the acute admission wards at St Michael's Hospital, between December 1996 and April 1997.

e) Patients with a longstanding dissociative disorder were also identified from the regular attenders at the community-based resource centres and outpatient clinics of the South Warwickshire Mental Health Services NHS Trust, between December 1996 and April 1997.

f) The control subjects were undergraduate students at the University of Wolverhampton. The study was advertised and voluntary participants were recruited on the campus, between December 1996 and April 1997.

#### **5.5.1.3 Inclusion criteria for the samples**

a) DSM-IV criteria were used in the diagnosis of all patients; the diagnoses were confirmed by the consultant psychiatrist responsible clinically for the patient.

b) Patients who currently suffered from a major depressive episode were included, whether it was their first episode, a recurrent episode during the course of a recurrent depressive disorder, or an episode during the course of a bipolar mood disorder.

c) Patients with all subtypes of schizophrenia were included, and they were all experiencing symptoms of the active phase of schizophrenia at the time of the study.

d) Inpatients with a major depressive episode, schizophrenia, or a dissociative disorder, were approached during the 2nd to 7th day after admission to St Michael's Hospital, if and only if their clinical condition was such that their

participation in the study was not considered to be clinically contra-indicated by the consultant psychiatrist of the relevant treatment team.

e) Patients suffering from alcohol withdrawal were included if they were receiving an alcohol withdrawal treatment regimen, and if they were at “Day 2” or “Day 3” of the regimen.

#### **5.5.1.4 Exclusion criteria for the samples**

a) Patients with a major depressive episode and significant comorbid psychopathology or personality problems were excluded from the study, in order to limit confounding factors or symptoms in the analysis of the data.

b) Patients with alcohol withdrawal as well as significant comorbid psychopathology or personality problems were also excluded from the study, in order to limit confounding factors or symptoms in the analysis of the data.

c) Patients with alcohol withdrawal as well as a history of significant other psychoactive substance use were excluded from the study. Patients with alcohol withdrawal and occasional cannabis use, however, were not excluded from the study.

d) Patients  $\leq 18$  years old were excluded from the study for 2 reasons: first, because of the higher levels of dissociation found in children and teenagers, and second, because of the ethical implications such as informed consent from parents or carers.

e) Control subjects with a history of psychiatric treatment were excluded from the study.

#### **5.5.1.5 Ethical considerations for the psychometric validation of the SSD**

a) The protocol for the entire study (psychometric validation as well as the study of concurrent electroencephalographic correlates) was submitted to and

approval was obtained from the Warwickshire Research Ethics Committee (for the psychometric validation that took place mainly in South Warwickshire), the Maudsley Hospital Research Ethics Committee (for the study of the EEG correlates that took place at the Institute of Psychiatry, London), the Coventry Research Ethics Committee (for the possibility, ultimately unutilised, of an extension of the study to the Walsgrave Hospital, Coventry), and the University of Wolverhampton Research Ethics Committee (for the participation of volunteer undergraduate students as controls).

b) An information sheet was provided for all subjects and informed consent was obtained from all subjects (Appendix 2).

c) See under 5.5.1.4.d) above: Inpatients were only included where their participation in the study was not clinically contra-indicated, e.g., where their clinical condition and mental state were such that their participation was not anticipated to result in significant distress to the patient. Each patient's "fitness to participate" was assessed by his or her consultant psychiatrist.

d) No reimbursement was offered to the subjects, because of the Warwickshire Research Ethics Committee's consensus view that the study may potentially benefit not only future patients, but also the patients who participated.

e) If the patient preferred, the contents of their scale responses were made available to the relevant consultant psychiatrist to be considered in decisions regarding the treatment and care of the patient.

## ***5.5.2 Instruments used in psychometric validation of the SSD***

### **5.5.2.1 SSD**

The State Scale of Dissociation - the scale under development (Appendix 3). To reiterate, the SSD is a 56-item self-report measure, the items of which cover 7 dissociative symptoms: derealisation, depersonalisation, identity confusion, identity alteration, conversion, amnesia, and hypermnesia. The intensity of the experience is rated by ticking one of a row of 10 unnumbered squares, anchored by the phrases “Not at all” on the left and “Very much so” on the right (Appendix 3).

The additional questions to the SSD cover a possible history of previous contact with a psychiatrist, previous brain damage, current medication, and psychoactive substance use during the previous month.

The subject's age, gender, date of data collection, regular medication, psychiatric diagnosis, the results of computerised tomography or magnetic resonance imaging of the brain if performed, and time of administration of the first and the second SSD were recorded.

### **5.5.2.2 DES**

The Dissociative Experiences Scale (Bernstein & Putnam, 1986) is a 28-item self-report measure where the respondent is asked to circle, from a row of percentages from 0% to 100%, the percentage of the time that they experience the symptom.

The Dissociative Experiences Scale (Bernstein & Putnam, 1986) was chosen as the most widely used and thoroughly validated existing scale of dissociative experiences (i.e. ‘trait’ dissociation), to serve as an external quasi-criterion (Burisch, 1984) with which the SSD could be compared. However, the shortcomings of such an exercise, given the different time frames and the limited symptom overlap between the



SSD and DES (see Chapter 2) have to be kept in mind. Although not a state measure of dissociation, the DES has the benefit of widespread use and repeated psychometric validation, in patients with dissociative disorders as well as other clinical samples and normal controls.

The most problematic aspect of its use alongside the SSD is its limited symptom coverage. (The DES covers only depersonalisation/derealisation, amnesic dissociation, and absorption/imaginative involvement only). Furthermore, absorption/imaginative involvement is not a commonly accepted symptom of dissociation, and is not recognised by the DSM-IV criteria for dissociative disorders as an important symptom in those disorders. Rather, it appears that absorption/imaginative involvement exemplifies a range of paranormal experiences that manifest as a kind of personality trait in certain individuals, and that it is not a marker of state dissociation.

#### **5.5.2.3 BDI**

The Beck Depression Inventory (Beck et al., 1961; Beck, 1978) is a 21-item self-report measure where the respondent is asked to circle the most appropriate of 4 statements for each of 21 symptoms. The circled response indicates the severity of the symptom during the previous week, including the day of completion of the questionnaire.

It was necessary to include a measure of depression because of the not infrequent occurrence of dissociative symptoms during the course of a depressive illness. The Beck Depression Inventory (Beck et al., 1961) was chosen as a well-validated depression scale that also covers somatic and vegetative symptoms. The BDI was chosen not only for its range of symptoms (see Chapter 5), but also because

of its self-report format unlike, for example, the Hamilton Depression Rating Scale (HAM-D), which is clinician-rated. Another factor against the choice of, for example, the HAM-D was that it contains items relating to derealisation/depersonalisation and paranoid symptoms.

#### **5.5.2.4 BAI**

The Beck Anxiety Inventory (Beck et al., 1988; Beck, 1987, 1990) is a 21-item self-report measure where the respondent is asked to place a cross next to each symptom in the column that most accurately rates the intensity of their experience during the previous week, including the day of completion of the questionnaire: not at all, mildly, moderately, or severely.

It was necessary to measure anxiety symptoms at the same time as the dissociative symptoms, because of the historical (Roth, 1969) and clinical (see Van der Kolk, 1994 on post-traumatic stress) overlap and comorbidity between dissociative and anxiety symptoms. The Beck Anxiety Inventory (Beck et al., 1988) was chosen as a well-validated anxiety counterpart to the BDI, with both historical origins and a format similar to that of the BDI, but without overlap with the BDI. The BAI was also chosen because of its self-report format unlike, for example, the Hamilton Anxiety Rating Scale (HAM-A), which is clinician-rated. Another factor against the choice of, for example, the HAM-A was that it contains items relating to depressed mood.

#### **5.5.2.5 SCI-PANSS**

The Structured Clinical Interview for the Positive and Negative Syndrome Scale (Kay, 1991; Opler et al., 1992) is a 30-item interviewer-based scale. The respondents' answers to a series of questions and also their behaviour during the interview are

rated according to a rating manual to yield a score of 1 to 7 per item, indicating the severity of the symptom during the previous week, including the day of the interview.

The Structured Clinical Interview for the Positive and Negative Syndrome Scale (Kay, 1991; Opler et al., 1992) was chosen because of its coverage of general psychopathology in addition to positive and negative symptoms of psychosis, its inclusion of depression and anxiety subscales, its coverage of some psychotic symptoms (e.g., suspiciousness, hostility, excitement, difficulty in abstract thinking, and stereotyped thinking) in greater detail than the SAPS and SANS, and its greater apparent ability to distinguish between dissociative and psychotic symptoms. The PANSS was also chosen because of its history of application in various clinical and non-clinical populations (Bassett et al., 1994), compared to the SAPS and SANS that were designed for and validated in patients with schizophrenia.

The administration and rating of the SCI-PANSS were facilitated by the manual and training videotapes (Opler & Ramirez, 1992).

### *5.5.3 Procedure followed for psychometric validation of the SSD*

After obtaining informed consent (Appendix 2), the following scales were administered, in the order indicated:

- \* SSD
- \* BDI
- \* BAI
- \* DES
- \* SCI-PANSS
- \* SSD for the second time.

For the clinical subjects, demographic data were collected from the subjects' clinical files while they were completing the self-report measures. For the non-clinical subjects, demographic data were collected after obtaining informed consent. After the problems relating to missing data in the pilot study to the psychometric validation, one of the procedural aims during data collection here was to identify any missing responses immediately after completion of the scales, and to point them out to the respondent, after which they invariably responded to the relevant item.

#### *5.5.4 Analysis of psychometric validation of the SSD*

##### **5.5.4.1 Data processing and software used in psychometric validation of the SSD**

###### *5.5.4.1.1 Scoring of data*

The handwritten data were scored according to the relevant scale manuals in the case of the DES, the BDI, the BAI, and the SCI-PANSS. For the SSD, the data were scored in the following way:

To determine an item score:

Scores are in the range of 0 - 9.

A tick in the first square = score of "0";

A tick in the second square = score of "1";

A tick in the third square = score of "2"; etc. ...;

A tick in the last (10th) square = score of "9".



### Computation of subscale scores:

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Derealisation = Mean ( scores of items 1 - 8 )

Depersonalisation = Mean ( scores of items 9 - 16 )

Identity confusion = Mean ( scores of items 17 - 24 )

Identity alteration = Mean ( scores of items 25 - 32 )

Conversion = Mean ( scores of items 33 - 40 )

Amnesia = Mean ( scores of items 41 - 46 )

Hypermnesia = Mean ( scores of items 47 - 56 )

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Total SSD score = Mean ( scores of items 1 - 56 )

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#### **5.5.4.1.2 Data entry and software used**

The raw data were entered into a data file, using the SPSS computer software (Statistical Package for the Social Sciences). The data were then checked for errors, before new variables were computed, such as total scale scores and subscale scores (as indicated above for the SSD and according to the manuals for the other scales).

The data file was also exported into the STATISTICA software package. Subsequent analyses were variably performed using the SPSS and the STATISTICA packages, depending on the menus of analyses offered by the two packages and the graphical data display options required for each analysis.

#### **5.5.4.2 Descriptive statistics in psychometric validation of the SSD**

The following descriptive statistics and graphical display methods were used:

- a) Demographic characteristics of study population.
- b) Boxplots of the distribution of SSD and subscale scores.

- c) Fitting of normal distributions to cumulative frequency distributions of SSD and subscale scores.
- d) Bar charts of mean SSD and subscale scores across groups.
- e) Stacked bar charts of SSD subscale contributions across diagnostic groups.
- f) Stacked bar charts of contributions by SSD and other scales across groups.

#### **5.5.4.3 Confidence intervals in psychometric validation of the SSD**

- a) Error bars showing 95% confidence intervals for SSD and subscale scores across groups.
- b) Error bars showing 95% confidence intervals for DES and subscale scores, BDI scores, BAI scores, and PANSS subscale and cluster scores across groups.

#### **5.5.4.4 Validity testing of the SSD**

##### **5.5.4.4.1        *Content validity***

Content validity testing, as described in Chapter 3 (section 3.3.1), was used in the development of the SSD, based on a review of the literature and on consultation with clinicians experienced in the treatment of patients with dissociative disorders.

The design and construction of the SSD was based on the theory, as referred to in Chapter 1, of a continuum of dissociative experiences from normality to severe psychopathology, on observations that rapid, transient fluctuations in dissociative states do occur, and the premise that these fluctuations could be quantified. The assumptions and concepts underlying this design were clear at the time the experts assessed the content validity of the SSD.

From the actual items of the SSD and from the table of content description of the SSD (Table 4.1), these experts judged the contents of the SSD to measure what it is supposed to measure.

#### **5.5.4.4.2      *Criterion-related validity***

Criterion-related validity (Figure 5.7) makes use of correlational and regression analyses.

##### **5.5.4.4.2.1      External criterion-related validity**

External criterion-related validity exemplifies the criterion-group approach to the construction of a scale. Here the presence of a dissociative disorder was taken as an external criterion of the extreme expression of dissociative symptomatology.

##### **5.5.4.4.2.1.1      Concurrent validity**

The method of testing concurrent validity in contrasting groups also contributes towards the testing of construct validity. Here the contrasting groups of the patients with a major depressive episode, schizophrenia, alcohol withdrawal, or a dissociative disorder, and the control subjects were used to test the concurrent validity of the SSD. In particular, subjects were divided into 2 groups: those with and those without a dissociative disorder. The following tests were performed:

The Kruskal-Wallis test was used to test for differences in SSD and subscale scores among the 5 diagnostic groups. Error bars were used for the visual presentation of the difference in SSD score between those with and those without a dissociative disorder. The independent samples T-test was used to test the difference in SSD score between those with and those without a dissociative disorder.

#### 5.5.4.4.2.1.2 Predictive validity

The ability of the SSD to predict accurately whether a subject would fall in the group of patients with a dissociative disorder, was tested as described in Chapter 3 (section 3.3.2.1.1), despite the limitations of such an exercise. The SSD was not designed as a diagnostic instrument, and its planned sensitivity to short-term variations in the intensity of dissociative experiences, without taking account of longer-term trends (including continuous or enduring symptoms of dissociation, or the longitudinal course of dissociative symptoms), makes it unsuitable for diagnostic use.

##### 5.5.4.4.2.1.2.1 *Cut-off score*

A range of possible cut-off scores, based on the error bars from section 5.5.4.4.2.1.1 above, and following in score increments of 0.1, were considered in turn (Altman, 1991), and the sensitivity and specificity calculated for each. A graphical approach was followed in choosing the best cut-off score. Sensitivity was plotted against (1 - specificity) for each cut-off score, and the points joined, thus obtaining a “receiver operating characteristic” (ROC) curve. The assumption was that the “cost” of a false negative prediction of a diagnosis of a dissociative disorder is the same as that of a false positive prediction. The cut-off that maximised the sum of the sensitivity and specificity (the point nearest the top left hand corner of the graph) would be taken as the best cut-off score. However, the ROC curve takes no account of the prevalence of the dissociative disorders, and approaches the data from the side of the diagnosis.

##### 5.5.4.4.2.1.2.2 *Posterior probabilities*

The data were then examined from the side of the SSD score, and the positive predictive value of the SSD cut-off score, the negative predictive value, and the posterior probabilities calculated (Altman, 1991). The positive predictive value (PPV)



represents the proportion of subjects with an SSD score above the cut-off score, correctly diagnosed with a dissociative disorder. The negative predictive value (NPV) represents the proportion of subjects with an SSD score below the cut-off score, correctly diagnosed as not having a dissociative disorder. The positive and negative predictive values (PPV and NPV) depend on the prevalence of dissociative disorders, here taken to be 5-10% (Michelson & Ray, 1996). A low prevalence (also called the prior probability of a dissociative disorder) would result in a high negative predictive value and a low positive predictive value. The posterior probabilities are revised estimates of the probability of a dissociative disorder for those subjects who have SSD scores above or below the cut-off score, based on the PPV and NPV. The usefulness of the SSD was then assessed by looking at the difference between the prior and posterior probabilities.

#### *5.5.4.4.2.1.2.3 Post-test odds*

The post-test odds against a diagnosis of a dissociative disorder depend on the pre-test odds and the likelihood ratio. The pre-test odds against a diagnosis of a dissociative disorder depend on the prevalence of dissociative disorders in the general population. The likelihood ratio is a ratio of the probability of getting an SSD score above the cut-off if the person truly had a dissociative disorder, to the probability of getting an SSD score above the cut-off if the person did not have a dissociative disorder. The likelihood ratio, therefore, makes use of the sensitivity and specificity results. The likelihood ratio (and post-test odds) indicates the value of the SSD for increasing certainty about a diagnosis of a dissociative disorder.

#### 5.5.4.4.2 Internal criterion-related validity

Often there is no external criterion for the construct that is being measured, e.g., in the case of a psychiatric disorder, the diagnostic criteria may be vague or inadequately tested. In such cases, in the absence of a well-defined external criterion, an internal criterion may be used in validation. Then the total score of the scale may be taken as the criterion, and the correlation of each item with the total score will test the internal validity of the scale. Similarly, the correlations of items with their respective subscales will give an indication of the internal validity of each subscale. Internal criterion-related validity testing represents an example of the itemetric approach to the construction of a scale.

In the case of the SSD, the lack of consensus in the literature about the domain of dissociation motivated the testing also of internal criterion-related validity, and Pearson correlation coefficients were used. The correlations were assessed at three levels:

- a) Item-subscale correlations
- b) Item-total correlations
- c) Subscale-total correlations.

#### 5.5.4.4.3 *Construct validity*

Construct validity (Figure 5.8) is a wider concept that also draws from the other 2 validity-related concepts, i.e. content validity and some aspects of criterion-related validity also contribute to construct validity. The essence of construct validity is whether high and low scores behave in ways they are expected to behave according to theory or logical reasoning.

#### **5.5.4.4.3.1 Internal factor analysis**

Internal factor analysis represents the itemetric approach to scale construction. Here principal components analysis was performed, with varimax rotation, in order to maximise the likelihood of obtaining a simple factor structure. Factor scree plots were used in decisions about the significance of individual factors, in order to limit the number of factors to those which are “statistically significant”.

#### **5.5.4.4.3.2 Convergent validity**

Convergent validity follows the criterion-group approach and it refers to the extent to which the scale under construction measures the same phenomenon that another (proven) scale does. Here the DES served as an external quasi-criterion (Burisch, 1984) with which the SSD could be compared.

Clustered bar charts were used to present visually the comparison between SSD scores and DES scores across groups. The degree of association between the SSD and the DES was tested using Spearman’s rho correlation coefficients for each diagnostic group.

#### **5.5.4.4.3.3 Discriminant validity**

Discriminant validity, which also follows the criterion-group approach, assesses whether the scale under construction measures something other than what is measured by another (proven) scale. For example, if the BDI had good discriminant validity from the BAI, we could conclude that the 2 scales measure different symptoms.

Principal components analysis with varimax rotation was performed on pooled items from the SSD, the DES, the BDI, the BAI, and the PANSS. The hypothesis was

that if these scales measure different phenomena, the differences would be reflected in the factor loadings - the items of the different scales would load onto different factors.

#### **5.5.4.4.3.4 Questions to individuals about their responses**

Questions to respondents about their responses and about what influenced them in making decisions about responses, may contribute towards construct validity, and were therefore included in this study.

#### **5.5.4.5 Reliability testing of the SSD**

Figure 5.9 outlines the programme for reliability testing of the SSD. Reliability testing follows the itemetric approach to scale construction, and refers to the proportion of the variance that is the true variance, given the application of the SSD to a certain population under certain conditions. Four kinds of reliability testing were performed:

Very high item-item correlations might indicate which items are redundant in order to revise or discard those items.

Internal consistency also contributes towards construct validity. Cronbach's alpha, a commonly used coefficient of internal consistency, was also used in this study - first for the entire SSD, and then for each subscale.

Parallel forms represent an extension of internal consistency testing; the result is a coefficient of equivalence. Instead of administering 2 alternate forms of a scale, in order to reduce the cost of constructing 2 scales, a single scale is often constructed, and administered. When it comes to testing the scale, the method of split-half reliability is used: items are divided into 2 groups, e.g., all even-numbered items are grouped together, and all odd-numbered items together. Then the 2 halves are subjected to statistical analysis by, for example, the Spearman-Brown or Guttman methods.



The analysis for test-retest reliability is usually used to prove that a certain scale measures a stable phenomenon such as a personality trait consistently over time, i.e. that the same scale administered to the same person after a certain time interval, would yield the same result. Test-retest reliability represents the itemetric approach to scale construction. Test-retest reliability depends on the correlation between the score at the time of the first administration of the scale, and the score at the time of the second administration of the scale.

However, it might have been hypothesised that a possible lack of test-retest reliability would prove the opposite, that the SSD does not measure the phenomenon of dissociation (that is not stable over time) consistently over time, and that therefore the SSD is sensitive to temporal variability. However, the conditions at the first and second administration of the SSD were identical, and no experimental intervention was used specifically to alter the intensity of dissociation. Therefore the scores of the 2 sets of SSD were anticipated to correlate highly, and test-retest reliability was not considered useful in an assessment of the sensitivity of the SSD to temporal variability.

#### **5.5.4.6 Testing of the sensitivity of the SSD to temporal variability of dissociation**

The objective of the sensitivity of the SSD to temporal variability was tested in two ways as indicated in Figure 5.6: by visual inspection of the difference between the scores obtained at the first completion of the SSD and at the second completion of the SSD, and by statistical testing of the difference between those scores. The third way, i.e. testing the association between two sets of scores, was considered inappropriate, as discussed above under section 5.5.4.5. The time interval here was the time taken to

complete the SSD, the DES, the BDI, the BAI, and the SCI-PANSS, and no specific procedure was used either to provoke dissociation or to lessen the intensity of dissociative experience.

Error bars were used to compare SSD1 and SSD2 scores visually.

The test of the statistical difference between scores obtained on the first SSD and the second SSD was used here as one way of demonstrating that the two sets of SSD scores do not statistically belong to the same population. However, the scores do come from the same population, and the implication of a difference in scores is taken to show that SSD scores can change significantly within a short period of time, and therefore that the SSD is sensitive to changes in the short term in the intensity of the subjects' dissociative experiences. Testing the difference represents the criterion-group approach. The paired samples T-test was used here to compare SSD1 and SSD2 scores.

## ***5.6 Anticipated results of psychometric validation of the SSD***

The design and methods of the psychometric validation of the SSD were planned in such a way that the results would prove or disprove the sensitivity of the SSD to temporal variability in the intensity of dissociation, and the construct validity of the chosen symptom categories. Also, solid results were sought which would support the thorough psychometric validity and reliability testing of the SSD in a criterion group, contrasting clinical groups, and a control group.

The results of the psychometric validation of the SSD are presented in Chapter 6, and a discussion of the psychometric testing of the SSD in Chapter 7.

**Table 5.1.** Diagnoses of patients in pilot study to psychometric validation (n=10)

<i>ICD-10 diagnosis</i>		<i>No. of patients</i>
<i>1</i>	Disorders due to brain disease, damage, and dysfunction	2
<i>2</i>	Disorders due to psychoactive substance use	1
<i>3</i>	Schizophrenia	3
<i>4</i>	Bipolar affective disorder	1
<i>5</i>	Dissociative [conversion] disorders	3
<i>6</i>	Personality disorders	3 *

\* The total number of diagnoses in the third column is 13, due to comorbidity.

Table 5.2 Mean item scores and standard deviations (in ascending order)

All cases (n=53)

Patients (n=10)

Controls (n=43)

	N	Mean	Std. Deviation
Item 46	53	.49	1.96
Item 6	53	.53	2.10
Item 57	53	.58	2.15
Item 58	52	.60	2.17
Item 28	51	.65	2.27
Item 37	52	.67	2.02
Item 40	52	.69	2.42
Item 12	53	.79	2.32
Item 30	52	.83	2.49
Item 39	52	.83	2.30
Item 42	52	.85	2.45
Item 38	53	.85	2.36
Item 48	53	.85	2.66
Item 35	52	.92	2.59
Item 34	53	.92	2.66
Item 36	53	.92	2.36
Item 45	53	.98	2.78
Item 3	53	.98	2.45
Item 56	53	1.04	2.70
Item 15	53	1.04	2.71
Item 53	52	1.04	2.71
Item 8	53	1.08	2.67
Item 19	53	1.08	2.79
Item 47	53	1.09	2.71
Item 55	52	1.10	2.73
Item 27	53	1.11	2.78
Item 25	52	1.12	2.83
Item 5	53	1.13	2.79
Item 13	53	1.15	2.80
Item 24	53	1.17	2.74
Item 26	52	1.17	3.01
Item 54	52	1.19	2.92
Item 31	53	1.21	2.81
Item 18	51	1.22	2.94
Item 7	53	1.23	2.81
Item 16	53	1.26	2.95
Item 33	53	1.26	2.96
Item 20	53	1.32	3.00
Item 29	53	1.32	3.03
Item 51	52	1.33	2.90
Item 10	53	1.36	2.96
Item 1	53	1.36	2.87
Item 14	53	1.36	2.64
Item 9	53	1.38	2.92
Item 2	53	1.38	3.01
Item 50	53	1.45	2.94
Item 52	52	1.54	3.11
Item 17	53	1.57	3.03
Item 4	53	1.58	3.16
Item 22	53	1.58	3.12
Item 44	53	1.60	3.08
Item 11	53	1.60	3.20
Item 43	53	1.72	2.96
Item 32	53	1.89	3.30
Item 41	52	1.92	3.20
Item 21	52	1.94	3.56
Item 49	53	2.25	3.64
Item 23	53	2.34	3.57

	N	Mean	Std. Deviation
Item 46	10	2.60	4.01
Item 6	10	2.80	4.29
Item 57	10	3.10	4.25
Item 37	9	3.33	3.94
Item 58	9	3.44	4.36
Item 50	10	3.60	4.65
Item 39	9	3.67	4.44
Item 14	10	3.90	4.43
Item 36	10	4.00	4.11
Item 40	9	4.00	4.74
Item 42	10	4.00	4.47
Item 3	10	4.10	4.20
Item 30	9	4.11	4.65
Item 28	8	4.13	4.52
Item 12	10	4.20	3.91
Item 38	10	4.20	4.08
Item 47	10	4.50	4.74
Item 48	10	4.50	4.74
Item 24	10	4.60	4.27
Item 34	10	4.70	4.57
Item 56	10	4.90	4.48
Item 35	9	5.00	4.36
Item 5	10	5.10	4.48
Item 45	10	5.20	4.52
Item 8	10	5.20	4.08
Item 15	10	5.20	4.21
Item 53	9	5.44	4.39
Item 55	9	5.56	4.25
Item 27	10	5.60	4.06
Item 31	10	5.60	4.17
Item 19	10	5.70	3.97
Item 33	10	5.80	4.29
Item 2	10	5.80	3.97
Item 9	10	5.80	4.18
Item 1	10	5.90	3.98
Item 51	9	6.00	4.50
Item 10	10	6.00	4.19
Item 13	10	6.00	3.62
Item 16	10	6.00	4.19
Item 18	9	6.00	4.50
Item 7	10	6.10	3.45
Item 20	10	6.20	3.88
Item 25	9	6.22	3.90
Item 49	10	6.30	4.35
Item 54	9	6.44	4.00
Item 29	10	6.60	3.72
Item 17	10	6.60	3.60
Item 26	9	6.78	3.90
Item 22	10	6.80	3.71
Item 43	10	7.00	2.62
Item 52	9	7.00	3.97
Item 4	10	7.00	2.87
Item 23	10	7.00	3.74
Item 44	10	7.10	3.31
Item 11	10	7.40	3.20
Item 41	10	7.80	2.15
Item 32	10	8.00	1.76
Item 21	10	8.00	2.54

	N	Mean	Std. Deviation
Item 28	43	.00	.00
Item 40	43	.00	.00
Item 45	43	.00	.00
Item 46	43	.00	.00
Item 48	43	.00	.00
Item 57	43	.00	.00
Item 58	43	.00	.00
Item 6	43	.00	.00
Item 12	43	.00	.00
Item 19	43	.00	.00
Item 26	43	.00	.00
Item 13	43	2.33E-02	.15
Item 25	43	4.65E-02	.21
Item 34	43	4.65E-02	.30
Item 15	43	6.98E-02	.46
Item 27	43	6.98E-02	.34
Item 35	43	6.98E-02	.46
Item 38	43	6.98E-02	.26
Item 7	43	9.30E-02	.48
Item 54	43	9.30E-02	.43
Item 29	43	9.30E-02	.48
Item 42	42	9.52E-02	.30
Item 37	43	.12	.39
Item 53	43	.12	.45
Item 8	43	.12	.50
Item 30	43	.14	.77
Item 56	43	.14	.56
Item 16	43	.16	.65
Item 55	43	.16	.69
Item 20	43	.19	.96
Item 31	43	.19	.63
Item 18	42	.19	.71
Item 5	43	.21	.86
Item 36	43	.21	.71
Item 33	43	.21	.94
Item 39	43	.23	.75
Item 11	43	.26	.79
Item 3	43	.26	.90
Item 10	43	.28	.88
Item 1	43	.30	.86
Item 47	43	.30	.94
Item 4	43	.33	1.41
Item 44	43	.33	.71
Item 9	43	.35	1.04
Item 51	43	.35	.81
Item 2	43	.35	1.45
Item 22	43	.37	1.07
Item 24	43	.37	1.40
Item 17	43	.40	1.07
Item 52	43	.40	1.00
Item 32	43	.47	1.37
Item 43	43	.49	1.08
Item 21	42	.50	1.80
Item 41	42	.52	1.15
Item 14	43	.77	1.59
Item 50	43	.95	2.17
Item 23	43	1.26	2.54
Item 49	43	1.30	2.75



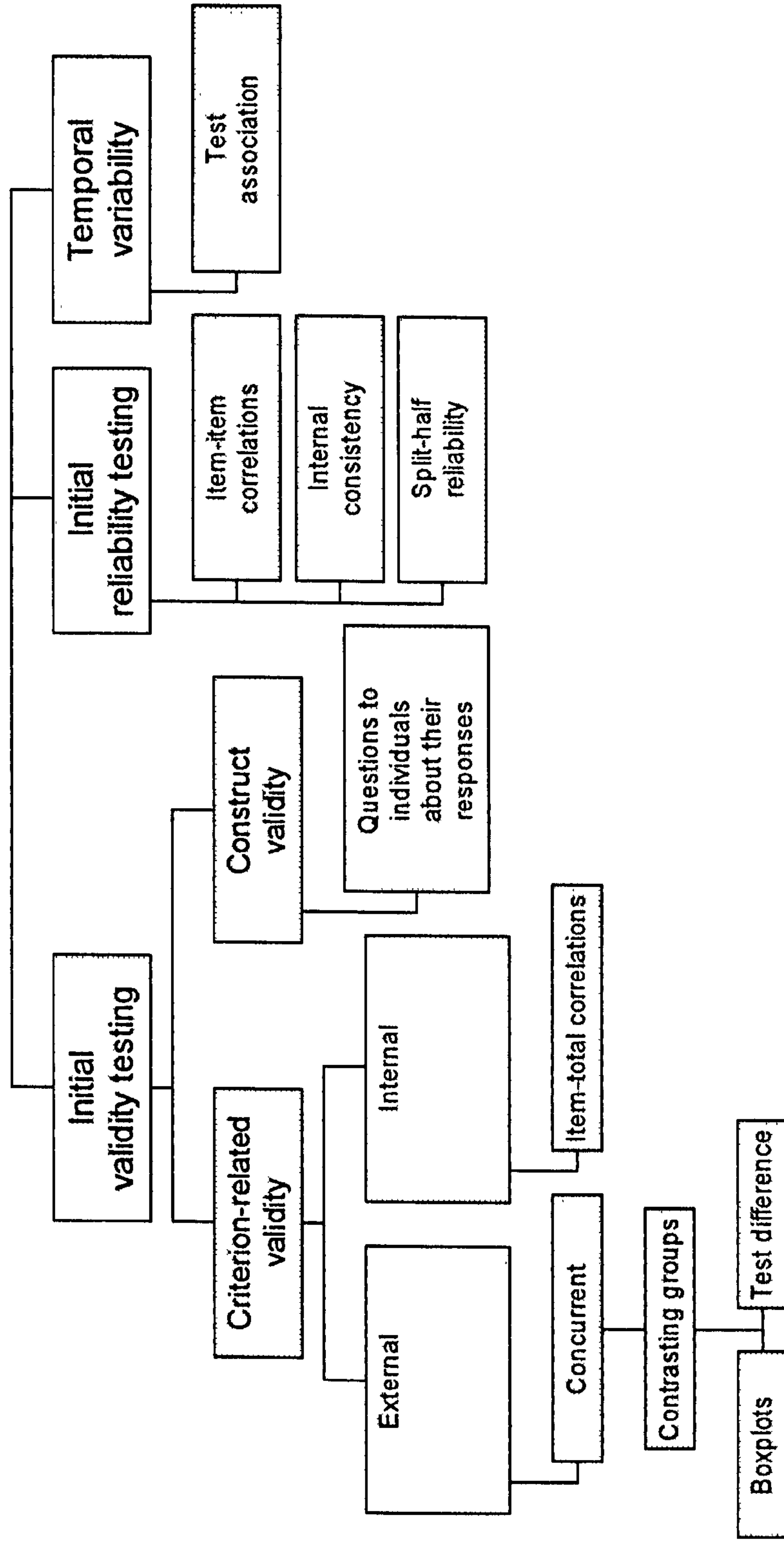
**Table 5.3** Item - total SSD correlation coefficients (Spearman's rho)

<i>Item number</i>	<i>All cases (N=53)</i>	<i>Controls (N=43)</i>	<i>Patients (N=10)</i>
1	** .529	** .472	.894
2	** .511	* .363	.775
3	** .420	.300	.949
4	** .575	** .446	.738
5	** .557	* .383	.775
6	.267	.	.775
7	** .479	.244	.738
8	** .451	.306	.894
9	** .597	** .478	.775
10	** .489	** .419	.447
11	** .558	* .394	.738
12	* .373	.	.738
13	** .444	.	.949
14	** .534	** .574	.632
15	* .355	.	.447
16	** .503	* .394	.894
17	** .681	** .523	.775
18	** .533	** .475	.447
19	* .373	.	.894
20	** .509	.282	.738
21	** .586	* .352	.258
22	** .465	* .381	.738
23	** .552	** .555	.738
24	* .369	* .347	.258
25	* .323	.112	.738
26	* .373	.	.894
27	** .430	.267	.894
28	* .373	.	.738
29	** .451	.282	.894
30	* .355	.282	.258
31	** .423	* .394	.775
32	** .588	* .347	.775
33	** .469	.253	.258
34	** .451	.282	.894
35	** .436	.282	.447
36	* .375	* .346	.775
37	** .537	** .492	.211
38	** .439	* .357	.316
39	** .530	** .472	.894
40	* .373	.	.894
41	** .702	** .567	-.775
42	** .540	** .467	.894
43	** .676	** .542	.316
44	** .625	** .541	.738
45	* .373	.	.894
46	* .373	.	.738
47	* .342	.301	.775
48	.267	.	.775
49	** .660	** .609	.775
50	** .393	** .457	.775
51	** .426	** .454	.775
52	** .556	** .511	.894
53	** .419	** .423	.775
54	** .452	* .330	.894
55	** .484	* .363	.894
56	** .452	* .330	.894
57	.267	.	.775
58	.267	.	.775

\*\* Significant at the 0.01 level (two-tailed); \* Significant at the 0.05 level (two-tailed)

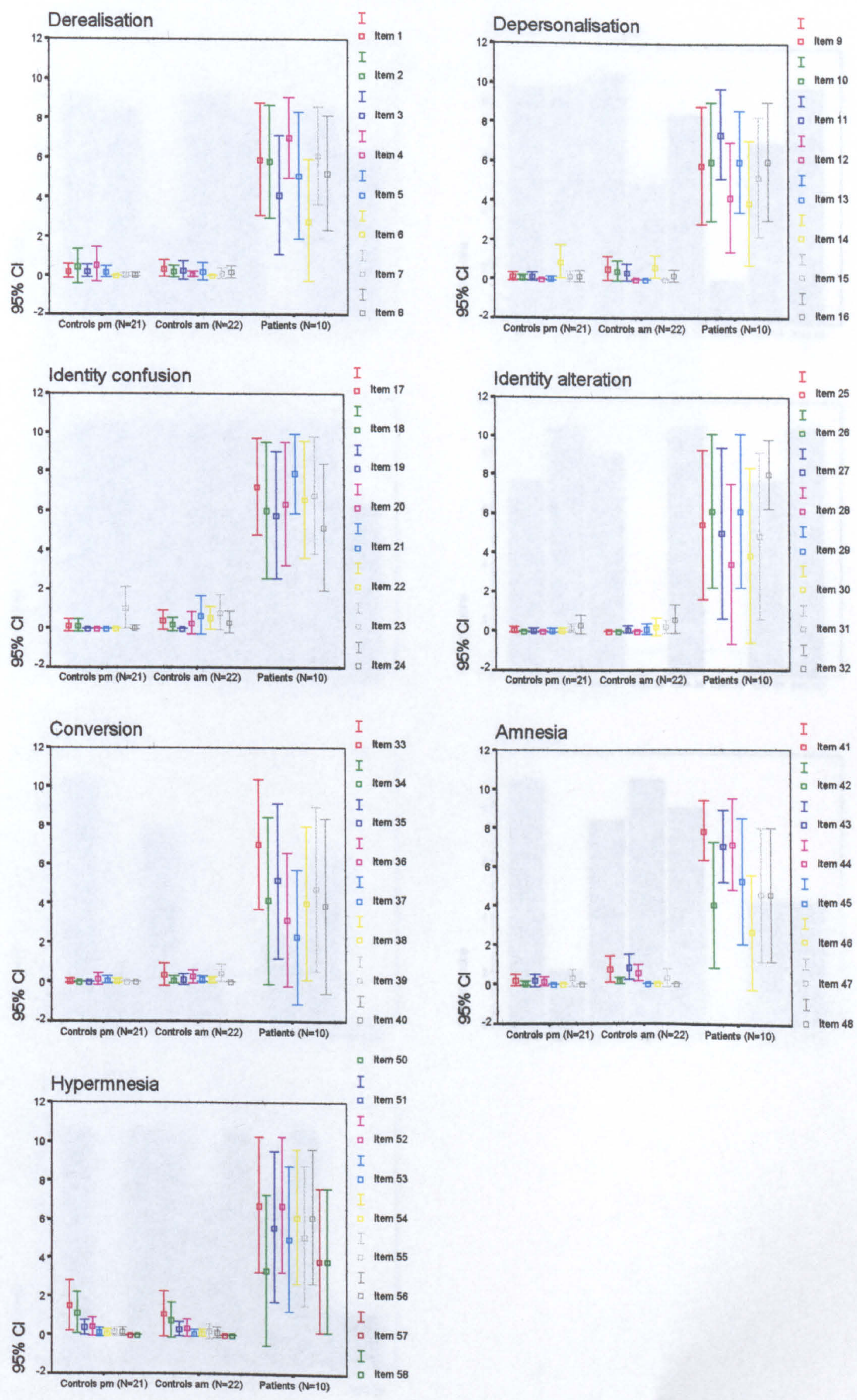
Correlation coefficients could not be computed for the following items in the control group: Items 13 and 15 (for each of these items only one person scored > 0); other items with missing values (all respondents scored 0).

Figure 5.1 Design for pilot study to psychometric validation



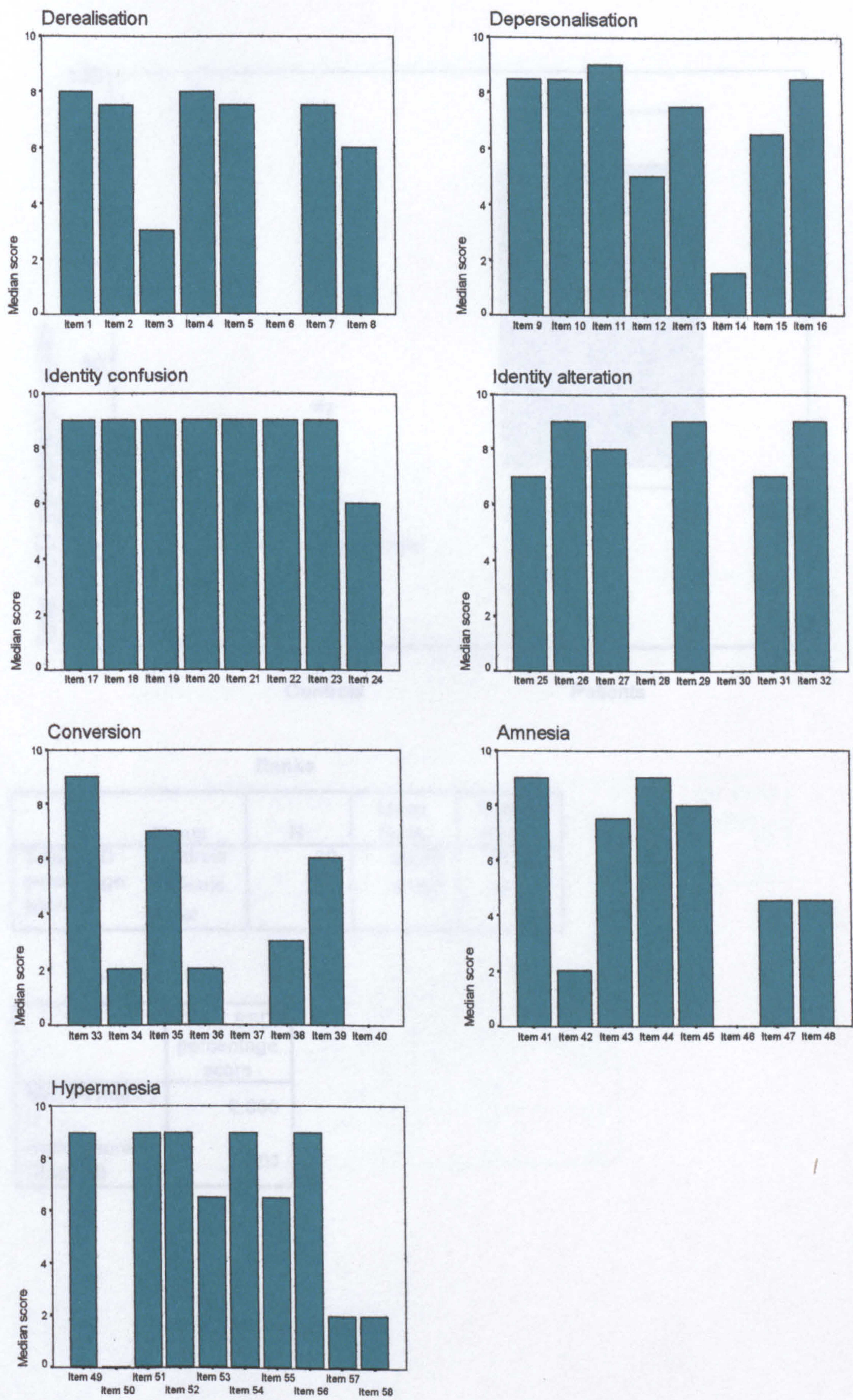


**Figure 5.2** Confidence intervals (95%) for item scores (by subgroup)



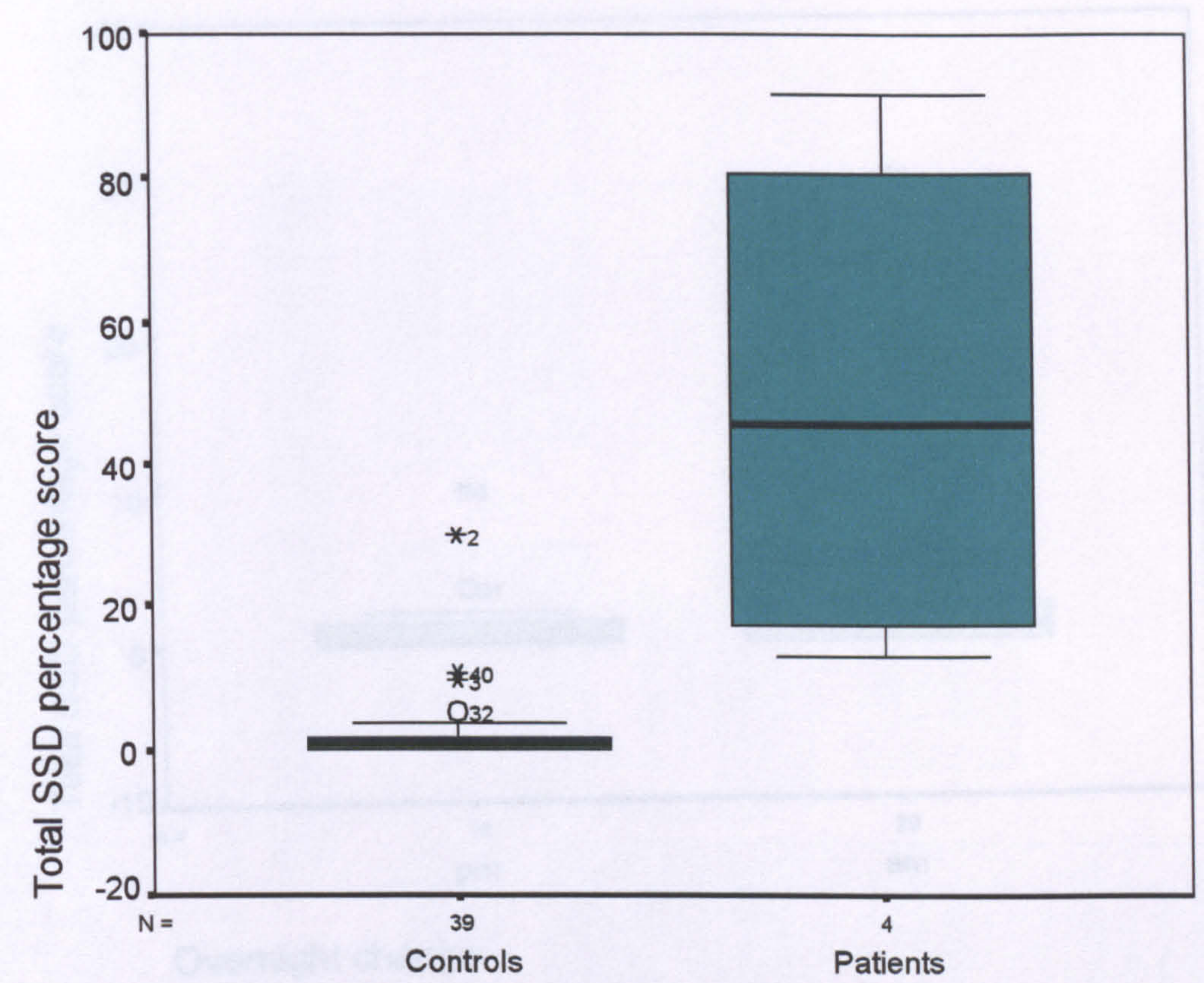


**Figure 5.3** Median item scores of patients (n=10)





**Figure 5.4** External validity of the SSD



**Ranks**

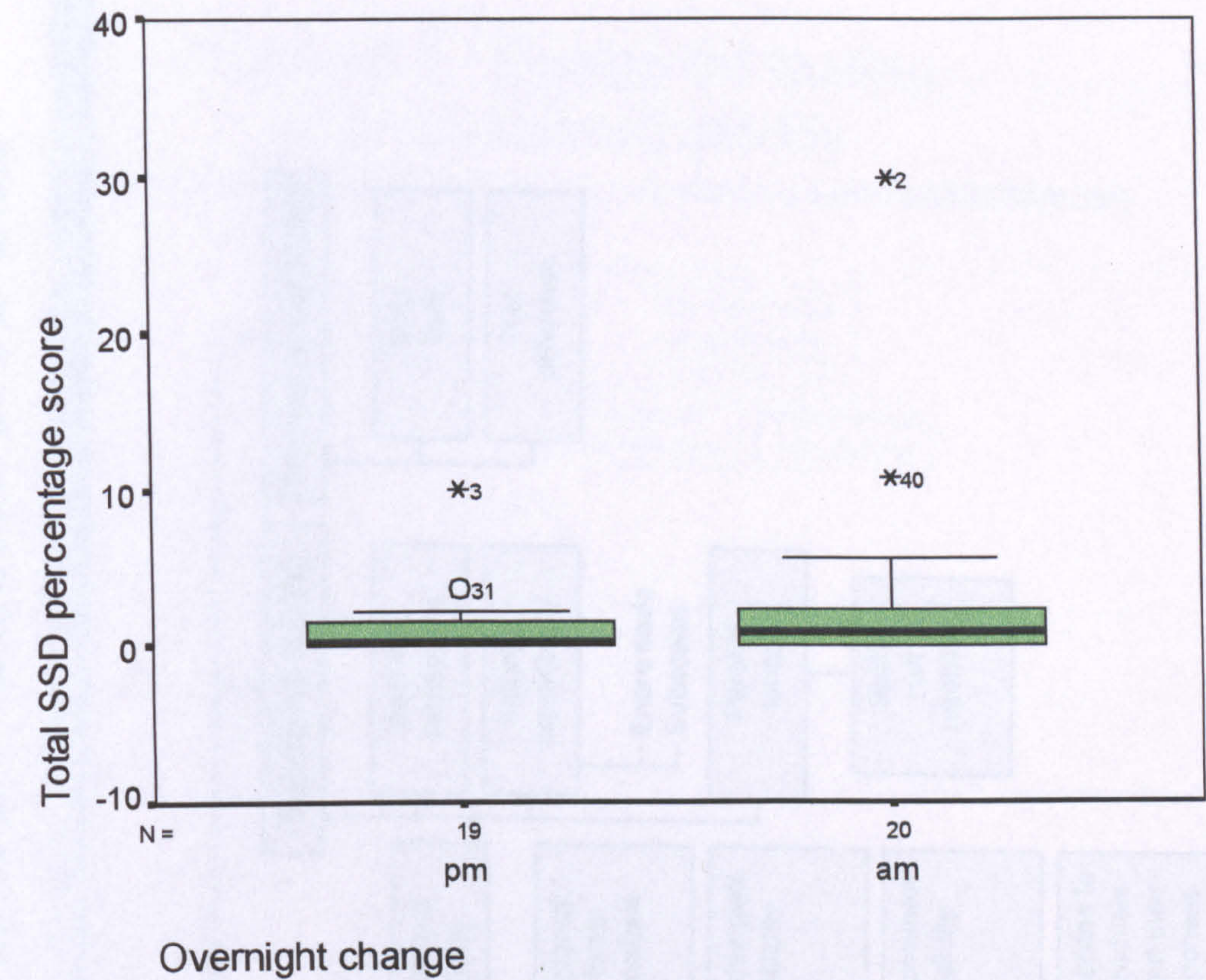
	Group	N	Mean Rank	Sum of Ranks
Total SSD percentage score	Controls	39	20.05	782.00
	Patients	4	41.00	164.00
	Total	43		

**Test Statistics**

	Total SSD percentage score
Mann-Whitney U	2.000
Significance (2-tailed)	.001



Figure 5.5 Overnight change in SSD score (controls)



Group Statistics

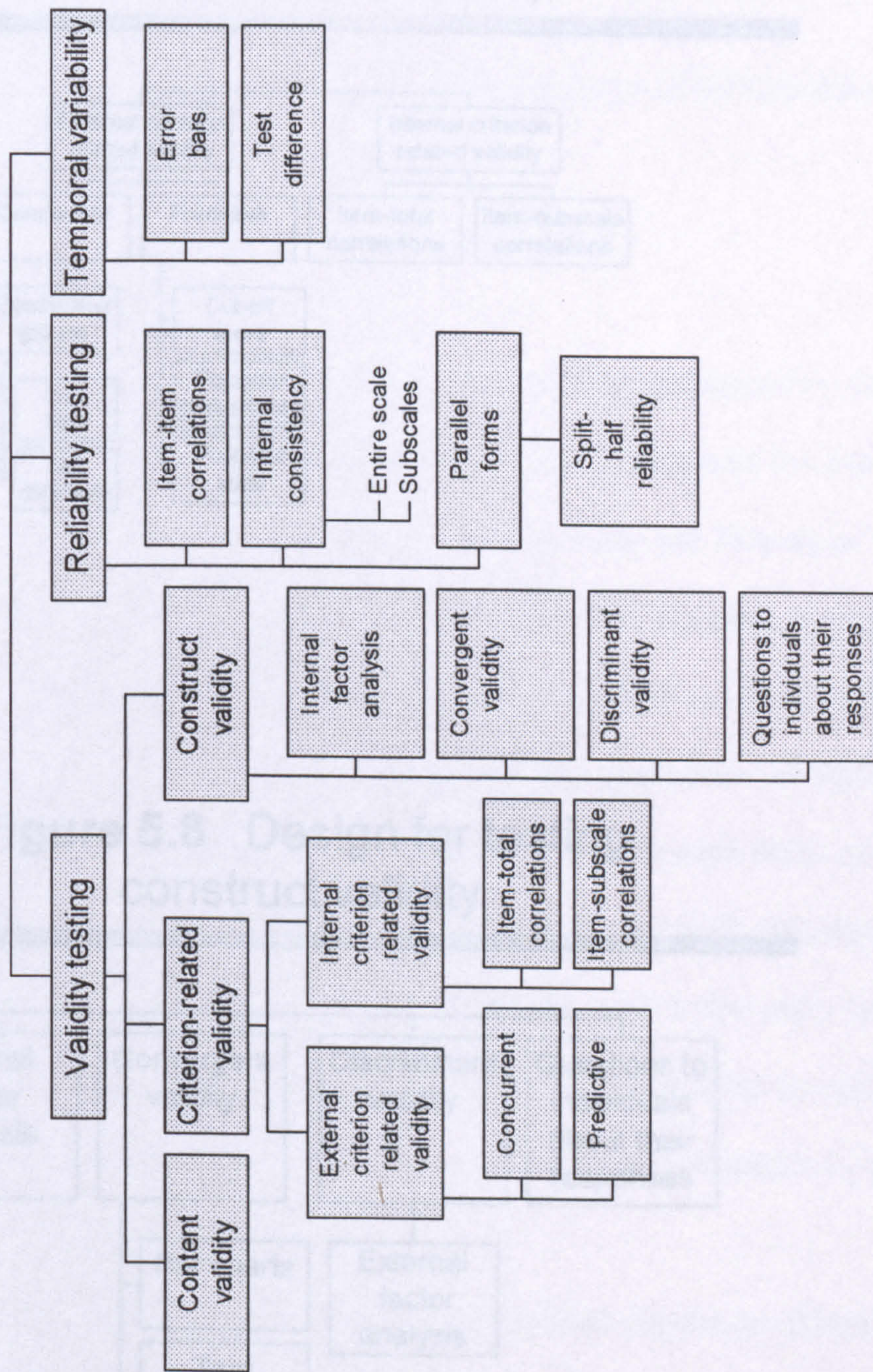
	Overnight change	N	Mean	Std. Deviation	Std. Error Mean
Total SSD percentage score	pm	19	1.28	2.38	.55
	am	20	3.12	6.84	1.53

Correlations

			Evening	Morning
Kendall's tau	Correlation coefficient	Evening	1.000	.297
		Morning	.297	1.000
	Sig. (1-tailed)	Evening	.	.065
		Morning	.065	.
	N	Evening	22	17
		Morning	17	22

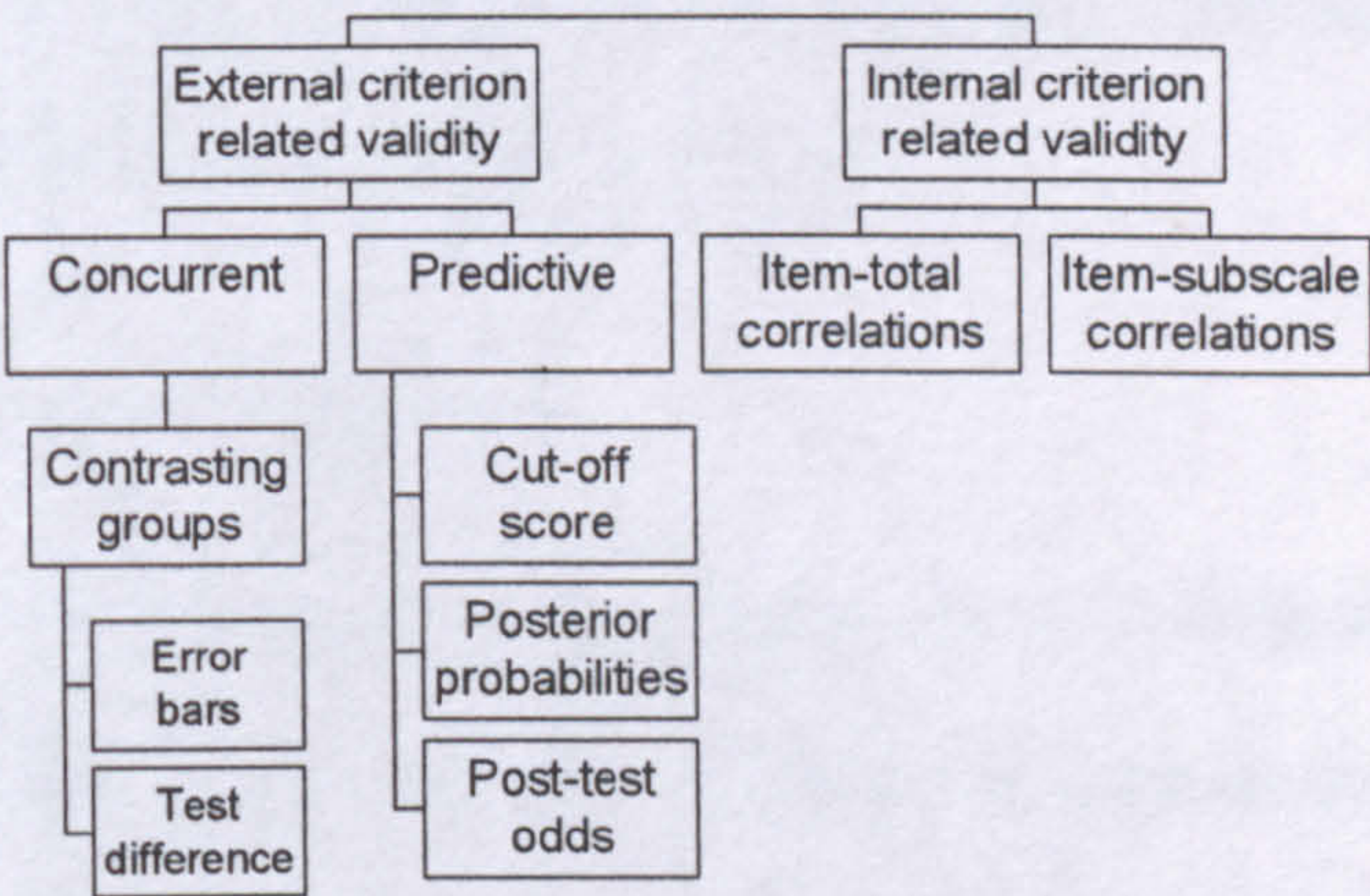


Figure 5.6 Design for psychometric validation of the SSD

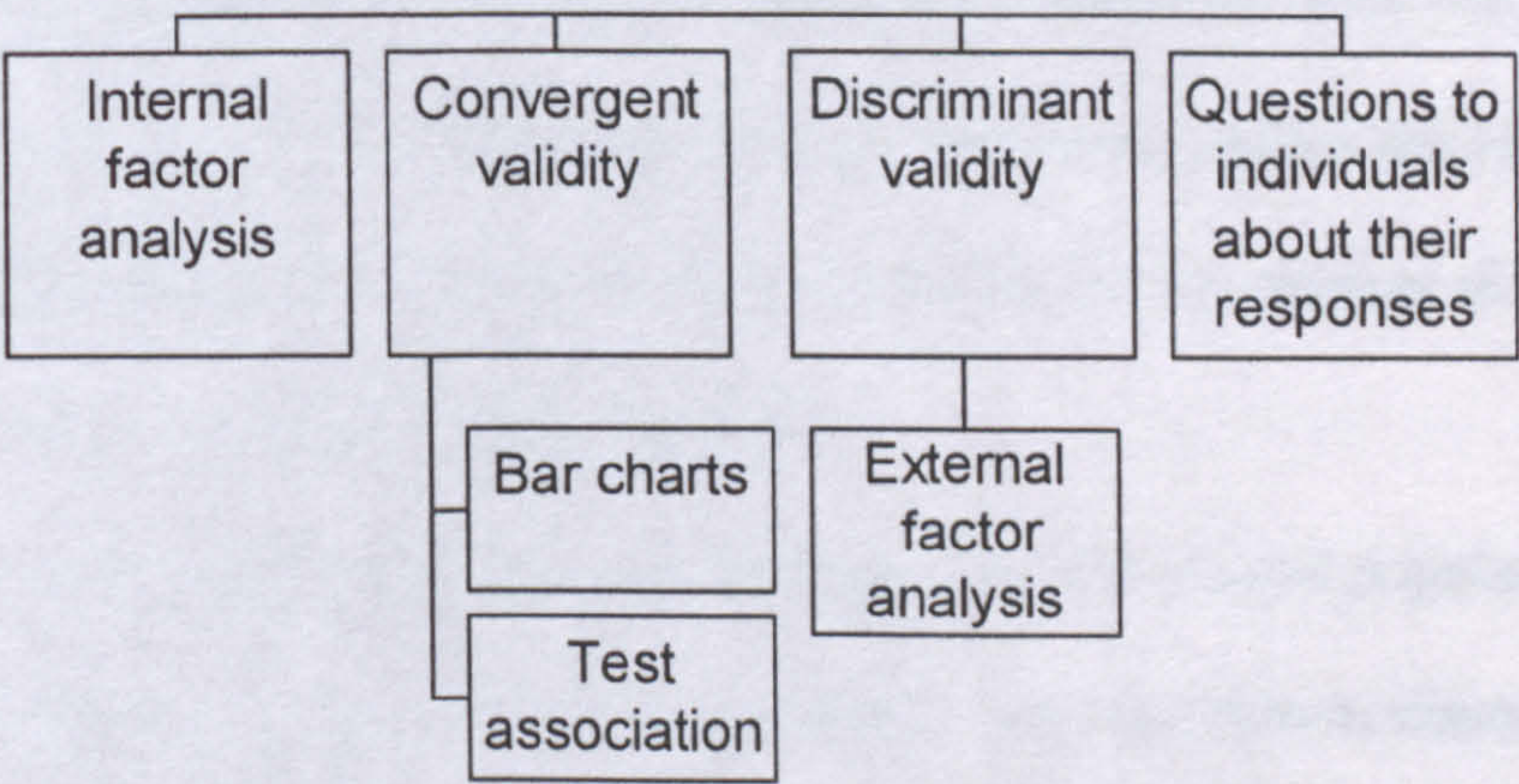




**Figure 5.7** Design for testing criterion-related validity



**Figure 5.8** Design for testing construct validity





## Psychometric validation of the SSD: Results

This chapter describes the results of the psychometric validation of the SSD following the methodology in Chapter 5 (section 5.5.4).

### 6.1 *Descriptive statistics*

Table 6.1 summarises the demographic characteristics of the study population. One of the control subjects, who provided a history of psychiatric treatment for anorexia nervosa and a depressive illness, was excluded from the study and all analyses were performed on responses of the remaining 63 control subjects. The mean duration of the period between the first and second administration of the SSD was 53 minutes.

Figures 6.1.1 - 6.1.8 show the boxplots of the distribution of SSD and subscale scores across diagnostic groups. The results of the Kruskal-Wallis test for the respective SSD subscales are presented along with the boxplots. Although not strictly a part of the descriptive statistics, and referred to again below under section 6.3.2.1.1 (concurrent validity), the Kruskal-Wallis test results are better interpretable when juxtaposed with the graphical representation of the relevant distributions, which is indeed part of the descriptive statistics.

The control population was younger than the clinical populations (Table 6.1), and would have been expected to experience more prominent dissociative symptoms than the older patients (Michelson & Ray, 1996). Nevertheless, their SSD scores were significantly lower than those of the clinical populations, suggesting that the higher scores in the clinical samples represented a true effect.

Figure 6.2 shows the result of the fitting of normal distributions to the observed cumulative frequency distributions of the SSD scores for each diagnostic group. The Kolmogorov-Smirnov test was performed for each subgroup and the value of the Kolmogorov-Smirnov one-sample D statistic is given at the top of each histogram. The Kolmogorov-Smirnov test is non-significant in all clinical groups, and approaches significance in the control group, suggesting the non-rejection of the hypothesis that the SSD and subscale data follow a normal distribution.

Figure 6.3.1 shows bar charts of mean SSD and subscale scores across groups. The scale of the Y-axis is identical in all the charts; therefore the identity confusion subscale stands out as the most sensitive and highly scored subscale in all diagnostic groups. The profiles of the groups are similar to those in Figures 6.1.1 - 6.1.8. Figure 6.3.2 shows stacked bar charts of SSD subscale contributions across diagnostic groups. The most striking feature is the relatively large contribution by the identity confusion subscale, especially in the groups with alcohol withdrawal, major depressive episode, and dissociative disorder.

Figure 6.4 shows stacked bar charts of the respective contributions by the SSD, BAI, BDI, and PANSS. The numerical scores of the BDI, BAI, and PANSS were divided by a factor in such a way that their scores would fall in a range comparable to that of the SSD. Hence, the BDI and BAI scores were divided by 7 and the PANSS score by 12.4. The most striking features here are the large anxiety component in the patients with alcohol withdrawal, the large depressive component in the patients with a major depressive episode, and the large components of anxiety, depression, and general psychopathology in the patients with a dissociative disorder.

The ten patients with dissociative disorders had the following DSM-IV diagnoses Dissociative amnesia (n=1), dissociative identity disorder (n=1), and dissociative disorder not otherwise specified (n=8).

## **6.2     *Confidence intervals***

Figure 6 5 1 shows error bars representing the 95% confidence intervals of the SSD and subscale scores across diagnostic groups. The scale on the Y-axis is identical in all the charts in order to allow easy visual comparison. These distributions are not dissimilar from the (non-parametric) distributions in figures 6.1.1 - 6.1.8. From visual inspection of figure 6 5 1, the subscales that discriminate most significantly between those with and those without a dissociative disorder are the conversion and amnesia subscales, as well as the total SSD score. The mean SSD score and 95 % confidence intervals for each diagnostic group are as follows: control subjects 0.51 (0.35 - 0.67); alcohol withdrawal 2.22 (1.51 - 2.93); schizophrenia 2.10 (1.26 - 2.94); major depressive episode 2.11 (1.44 - 2.78); dissociative disorder 4.33 (3.23 - 5.43).

Figure 6 5 2 shows error bars representing the 95% confidence intervals of the DES score and its subscale scores across diagnostic groups. The most striking feature is the overlap in the depersonalisation/derealisation subscale between patients with schizophrenia and dissociative disorders, which is more prominent than with the SSD subscales of derealisation and depersonalisation. Returning to Figure 6.5.1, the overlap between patients with schizophrenia and dissociative disorders is evident to a small extent in the derealisation subscale of the SSD, more so than in the depersonalisation subscale of the SSD - contrary to the expectation that depersonalisation would be the more prominent of the two in patients with schizophrenia

Figures 6.5.3 and 6.5.4 show error bars representing the 95% confidence intervals of the BDI and BAI scores respectively. The most striking features are the overlap between patients with a major depressive episode and dissociative disorders on the BDI, and the high BAI scores in patients with alcohol withdrawal.

Figures 6.5.5 and 6.5.6 show error bars representing the 95% confidence intervals of the PANSS total psychopathology score, the PANSS subscale scores, and the PANSS cluster scores. The high scores stand out in patients with dissociative disorders on general psychopathology and on the positive syndrome. The prominence of positive symptoms in the patients with dissociative disorders is further demonstrated by the high composite index<sup>15</sup> in those patients. Note that the scale of the composite index chart in Figure 6.5.5 is different from the other charts in that figure and that the values vary around zero. The composite index of patients with alcohol withdrawal, schizophrenia, and major depressive episodes are negative values, while those of the control subjects and the patients with dissociative disorders are positive values. See also Figure 6.7.2 for a visual comparison of the SSD score and PANSS composite index. Most striking in Figure 6.5.6 is the high value for the PANSS depression cluster score in the patients with dissociative disorders, even higher than the patients with a major depressive episode.

### **6.3      *Validity testing***

#### **6.3.1    *Content validity***

The SSD was developed along the lines of existing scales, theory, DSM-IV, and ICD-10, and this background contributes towards its content validity. The seven symptoms

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<sup>15</sup> PANSS composite index = PANSS positive syndrome scale score – PANSS negative syndrome scale score



that subsume the subscales, i.e. derealisation, depersonalisation, identity confusion, identity alteration, conversion, amnesia, and hypermnesia are commonly considered symptoms of dissociation (Chapters 2 and 3).

### **6.3.2 *Criterion-related validity***

#### **6.3.2.1 External criterion-related validity**

##### **6.3.2.1.1 *Concurrent validity***

The Kruskal-Wallis test, a non-parametric analogue of a one-way analysis of variance, was used to test for differences in SSD and subscale scores among the 5 diagnostic groups (see figures 6.1.1 - 6.1.8). In each case the test result was highly significant ( $p < 0.001$ ).

The subjects were then divided into two groups, those with and those without a dissociative disorder. Included in those without a dissociative disorder ( $n=120$ ) were the control subjects, the patients with alcohol withdrawal, patients with schizophrenia, and patients with a major depressive episode. Figure 6.6.1 shows error bars representing the 95% confidence intervals of the SSD score of the two groups. The independent samples T-test of the difference in SSD score between the two groups was highly significant ( $p < 0.001$ ).

##### **6.3.2.1.2 *Predictive validity***

The examination for a potential cut-off score that was based on the mean item score of each scale, was conducted through the successive consideration of a range of possible cut-off scores (see Chapter 5, section 5.5.4.4.2.1.2) and their sensitivities, specificities, and the ROC curve. The best cut-off for the SSD score was chosen as 3.9. An SSD score of 3.9 was where the sum of the sensitivity and specificity was

maximal, so that some “false positives” and some “false negatives” were accepted. Table 6.2 shows the two-way table of that cut-off of the SSD score (point 1 in Table 6.2), and the subsequent calculations pertaining to the predictive validity of the SSD.

Because sensitivity and specificity approach the data from the side of the diagnosis of a dissociative disorder, they do not provide a clinically useful assessment of the accuracy of the SSD; therefore the positive and negative predictive values (PPV and NPV) were also calculated (points 4 and 5 in Table 6.2). However, those values would depend on the prevalence of dissociative disorders.

Next, Bayes’ theorem (concerning the “probability of disease when the test is positive”) was used in further calculations of the PPV and NPV, taking into account the prevalence of dissociative disorders in the general population. These results (PPV, NPV, and posterior probabilities) are reported under points 6 - 8 in Table 6.2. The results of the likelihood ratio, the pre-test odds, and the post-test odds are reported under points 9 - 11 in Table 6.2.

#### **6.3.2.2 Internal criterion-related validity**

(a) Item-subscale correlations: No Pearson correlation coefficient was  $\leq 0.4$  for the whole study population ( $n = 130$ ). A few coefficients  $\leq 0.4$  were found at subgroup level, but these were not consistently low across all diagnostic groups.

(b) Item-total correlations: Only two items (items 41 and 42) yielded Pearson correlation coefficients  $\leq 0.4$  ( $n = 130$ ). These two items were subsequently discarded and excluded from further analyses.<sup>16</sup>

(c) Subscale-total correlations: Figure 6.6.2 shows the mean Pearson correlation coefficient (on the Y-axis) between each SSD subscale (on the X-axis) and

the total SSD score, for each diagnostic group (each group indicated by a line in a different colour). With the exception of four of the coefficients, all correlation coefficients are greater than 0.7. All the correlation coefficients are highly significant at the 0.01 level, with the exception of the four indicated by an arrow in figure 6.6.2, those being significant at the 0.05 level.

### **6.3.3 *Construct validity***

#### **6.3.3.1 Internal factor analysis**

Principal components analysis was performed and the factor solutions varimax rotated, for the whole study population (n=130). No simple factor structure was obtained through analyses of models with a variable number of factors. The model that best supported the subscale structure of the SSD was a 5-factor model, which accounted for 61 % of the variance, where the Eigen value of each of the 5 factors > 2.00, and the varimax rotation converged in 13 iterations. Table 6.3 shows the rotated factor loading matrix for the SSD item scores, using the 5-factor solution. Factor loadings with absolute values less than 0.30 are not reported in the interest of clarity.

Despite high factor loadings onto more than one factor by several items (especially derealisation and depersonalisation items, that appear to measure aspects of more than one factor), the factors corresponded to the SSD subscale structure in the following way:

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<sup>16</sup> The SSD in Appendix 3 is the revised and final version without these excluded items, originally numbered as 40 & 41.

Factor	Eigen value	% Variance	Items corresponding mostly to these subscales
1	23.762	42.4 %	Identity confusion, derealisation, depersonalisation
2	4.05	7.2 %	Conversion
3	2.282	4.1 %	Amnesia
4	2.051	3.7 %	Identity alteration
5	2.003	3.6 %	Hypermnnesia
Total:		61.0 %	

The closest or most pure correspondence was evident between the second factor and the conversion subscale of the SSD (see items 33 - 40 in Table 6.3).

When the same factor analysis was repeated for the clinical population (n=67), 5 factors accounted for 54.6 % of the variance, all Eigen values were > 2.30, varimax rotation converged in 13 iterations, and the smallest factor accounted for 4.1 % of the variance. The derealisation and depersonalisation items were more dispersed among three of the factors, the amnesia items were dispersed between two factors, and the identity alteration items clustered with conversion items in the second factor.

When the factor analysis was repeated for the control sample (n=63), 5 factors accounted for 69.5 % of the variance, all Eigen values were > 2.70, varimax rotation converged in 7 iterations, and the smallest factor accounted for 4.8 % of the variance. This time conversion and amnesia items clustered together in the first factor, and identity confusion items clustered separately from derealisation and depersonalisation items. Unfortunately the size of the dissociative disorders sample did not allow for meaningful factor analysis.



Principal components analysis was then repeated with an oblique rotation (“oblimin” in SPSS) with delta specified at 0.5, for all 130 cases, specifying in turn the extraction of 3, 4, 5, etc., factors. Every time, items from the identity alteration and conversion subscales tended to cluster together on one factor; items from the derealisation, depersonalisation, and identity confusion subscales tended to cluster together on another factor; amnesia and hypermnesia items tended to cluster on both of those factors; and the correlation coefficient between those 2 factors was  $> 0.7$ .

### **6.3.3.2 Convergent validity**

Figure 6.7.1 provides a visual comparison between mean SSD and DES scores across diagnostic groups. The DES score was divided by 11 to establish a range of scores comparable to that of the SSD. Spearman’s rho correlation coefficients between SSD and DES scores were high enough to be highly significant at the 0.01 level in all diagnostic groups, except in the patients with a major depressive episode where it was still significant, and in the patients with alcohol withdrawal, where the modest correlation coefficient still approached statistical significance.

### **6.3.3.3 Discriminant validity**

Principal components analyses were performed on the data that consisted of all the items of all the scales pooled together. This was done for the entire study population ( $n=130$ ) and the factor solutions were varimax rotated. No simple factor structure was obtained through analyses of models with a variable number of factors. The model that best supported the different scales was a 5-factor model, which accounted for 52.9 % of the variance, where the Eigen value of each of the 5 factors was  $> 4.20$ , and the varimax rotation converged in 8 iterations. Despite occasional high factor

loadings onto more than one factor by some items (especially some items from the BAI), the factors corresponded to the different scales in the following way:

Factor	Eigen value	% Variance	Items corresponding mostly to these scales
1	55.311	35.5 %	Depression (BDI), Anxiety (BAI), Identity confusion (SSD subscale)
2	8.922	5.7 %	DES
3	8.276	5.3 %	SSD (all subscales, and identity confusion less so)
4	5.765	3.7 %	PANSS (general, positive, and negative syndromes)
5	4.276	2.7 %	Anxiety (BAI)
Total:		52.9 %	

The identity confusion items of the SSD not only loaded significantly onto the first factor, but also loaded significantly onto the third factor along with the other SSD items, but less significantly than their loadings onto the first factor.

**6.3.3.4 Questions to individuals about their responses**

The majority of all subjects (83.1 %) did not find the completion of the SSD distressing. Some of the control subjects described some of the SSD items as “weird” and laughed about them. Some of the patients with dissociative disorders commented that the SSD items were very accurate descriptions of their experience, as if the scale had been written for them personally.

## **6.4      *Reliability testing***

### **6.4.1   *Item-item correlations***

The decision here was that Pearson correlation coefficients  $\geq 0.8$  would identify redundant items. Although some coefficients approached that value, no highly correlated item pairs were found consistently across diagnostic groups.

### **6.4.2   *Internal consistency***

Table 6.4 lists the values of Cronbach's coefficient alpha for the entire SSD and each of its subscales.

### **6.4.3   *Parallel forms***

Table 6.4 also gives the results of split-half reliability testing of the SSD.

## **6.5      *Temporal variability***

Figure 6.8 shows the change during data collection, in the 95% confidence intervals of the SSD scores across diagnostic groups. The paired samples T-test indicates a statistically significant difference between the scores for the first and second administration of the SSD in the patients with dissociative disorders, and a statistically highly significant difference between the scores in all other diagnostic groups. To check these findings non-parametrically, the Wilcoxon signed ranks test was also performed, which yielded Z-values with corresponding 2-tailed significances similar to the paired samples T-test:

Subgroup	Z-value	Significance (2-tailed)
Whole population	- 7.324	< 0.001
Controls	- 3.871	< 0.001
Alcohol withdrawal	- 3.660	< 0.001
Schizophrenia	- 3.055	0.002
Major depressive episode	- 3.420	0.001
Dissociative disorder	- 2.073	0.038

The results presented in this chapter will be discussed in Chapter 7.



**Table 6.1** Demographic characteristics of the study population

	N	Mean age (yrs) ± SD	% Male
Whole population	130	34.26 ± 6.01	43.8
Patients	67	38.94 ± 6.13	52.2
Controls	63	29.29 ± 4.80	34.9
Alcohol withdrawal	20	39.80 ± 5.38	80.0
Major depressive episode	19	44.21 ± 7.55	31.6
Schizophrenia	18	34.17 ± 5.37	55.6
Dissociative disorder	10	35.80 ± 4.07	30.0

- Medication: Prescriptions varied according to the diagnosis; 6 patients received neuroleptics only, 8 patients received antidepressants only, 3 received benzodiazepines only, 3 received analgesics only, 37 received a combination of 2 or more medications; alcohol withdrawal patients received either a chlormethiazole or a chlordiazepoxide detoxification regimen.
- Drug use in the last month: 20.8 % of subjects had used no drugs; 54.6 % had used alcohol only; 22.3 % had used alcohol and another drug (usually cannabis).
- Subjects had sustained no brain damage.
- Subjects were not under the influence of alcohol or another recreational drug during data collection.

Table 6.2 Predictive validity of the SSD

1.	<i>SSD score</i>	<i>Diss. Dis. +</i>	<i>Diss. Dis. -</i>	<i>Total</i>
	$\geq 3.9$	6	7	13
	$< 3.9$	4	113	117
	<i>Total</i>	10	120	130

2.     *Sensitivity* = 6 / 10 = 0.6  
          *Sensitivity* = proportion of patients with dissoc. disorder, correctly identified
3.     *Specificity* = 113 / 120 = 0.94  
          *Specificity* = proportion of patients without dissoc. disorder, correctly identified
4.     *Positive predictive value (PPV)* = 6 / 13 = 0.46  
          *PPV* = proportion of subjects with  $SSD \geq 3.9$  correctly diagnosed with dissoc. dis.
5.     *Negative predictive value (NPV)* = 113 / 117 = 0.97  
          *NPV* = proportion of subjects with  $SSD < 3.9$  correctly diagnosed without diss. dis.
6.     After Bayes' theorem:  
          
$$PPV = \frac{\text{sensitivity} \times \text{prevalence}}{\text{sensitivity} \times \text{prevalence} + (1 - \text{specificity}) \times (1 - \text{prevalence})}$$
 (Altman, 1991)  
          *PPV for 5% prevalence* = 0.35  
          *PPV for 10% prevalence* = 0.53
7.     After Bayes' theorem:  
          
$$NPV = \frac{\text{specificity} \times (1 - \text{prevalence})}{(1 - \text{sensitivity}) \times \text{prevalence} + \text{specificity} \times (1 - \text{prevalence})}$$
 (Altman,1991)  
          *NPV for 5% prevalence* = 0.98  
          *NPV for 10% prevalence* = 0.96
8.     Posterior probabilities:  
          35 - 53 % of those with  $SSD \geq 3.9$  have a dissociative disorder,  
          i.e.,  $SSD \geq 3.9$  makes for a 5-7 times higher risk of diagnosis of dissoc. disorder.  
          2 - 4 % of those with  $SSD < 3.9$  have a dissociative disorder,  
          i.e.,  $SSD < 3.9$  reduces the risk of a diagnosis of dissoc. disorder by 60%.
9.     *Likelihood ratio* =  $\frac{\text{sensitivity}}{1 - \text{specificity}} = \frac{0.6}{1 - 0.94} = 10$
10.    *Pre - test odds* =  $\frac{\text{prevalence}}{1 - \text{prevalence}}$   
          For 5% prevalence - 19:1 against diagnosis of dissociative disorder  
          For 10% prevalence - 9:1 against diagnosis of dissociative disorder
11.    *Post - test odds* = *pre - test odds* × *likelihood ratio*  
          For 5% prevalence - 1.9:1 against diagnosis of dissociative disorder  
          For 10% prevalence - 0.9:1 against diagnosis of dissociative disorder  
          i.e., if  $SSD \geq 3.9$ , then odds are <2:1 against diagnosis of dissociative disorder

**Table 6.3** Rotated factor matrix for SSD item scores

	Factor 1	Factor 2	Factor 3	Factor 4	Factor 5
Item 1	.41894		.59458		
Item 2	.47163		.38139		
Item 3	.38674		.62151		
Item 4	.67034		.33962		
Item 5		.42109	.39088		
Item 6	.37636		.30775		
Item 7	.58980				
Item 8		.30849	.47565		
Item 9	.59673	.37533	.47092		
Item 10	.62135	.42868			
Item 11	.67312	.36756			
Item 12		.35027	.63032		
Item 13	.38667		.65395		
Item 14		.56319	.40075		
Item 15	.70046				
Item 16	.57473	.46783			
Item 17	.70002	.34123			
Item 18	.72174	.37370			
Item 19	.74825				
Item 20	.77946				
Item 21	.84031				
Item 22	.82797				
Item 23	.59675			.38983	
Item 24	.63437				
Item 25		.30590		.74198	
Item 26			.31550	.66583	
Item 27		.52277		.48584	
Item 28				.82597	
Item 29				.65678	
Item 30	.34508	.37225		.44616	
Item 31	.70095				
Item 32	.59275	.41791			
Item 33	.32606	.58920		.31450	
Item 34		.59791			
Item 35	.30721	.56394		.33774	
Item 36		.63756			
Item 37		.64641	.32172	.45532	
Item 38		.76644			
Item 39		.63186		.39516	
Item 40		.49966		.44505	
Item 43	.44614	.41172	.35772		
Item 44	.43282	.45058			
Item 45	.30209	.36271		.41001	
Item 46			.51309		.37624
Item 47			.65454		
Item 48			.62303		
Item 49			.40529	.38319	.45279
Item 50		.51573			.52505
Item 51	.42835		.33602		.41655
Item 52	.62481				.45147
Item 53					.72791
Item 54	.42389				.58135
Item 55		.37948			.61439
Item 56					.61675
Item 57		.63643			.48241
Item 58		.55642			.45859

**Table 6.4** Reliability of the SSD

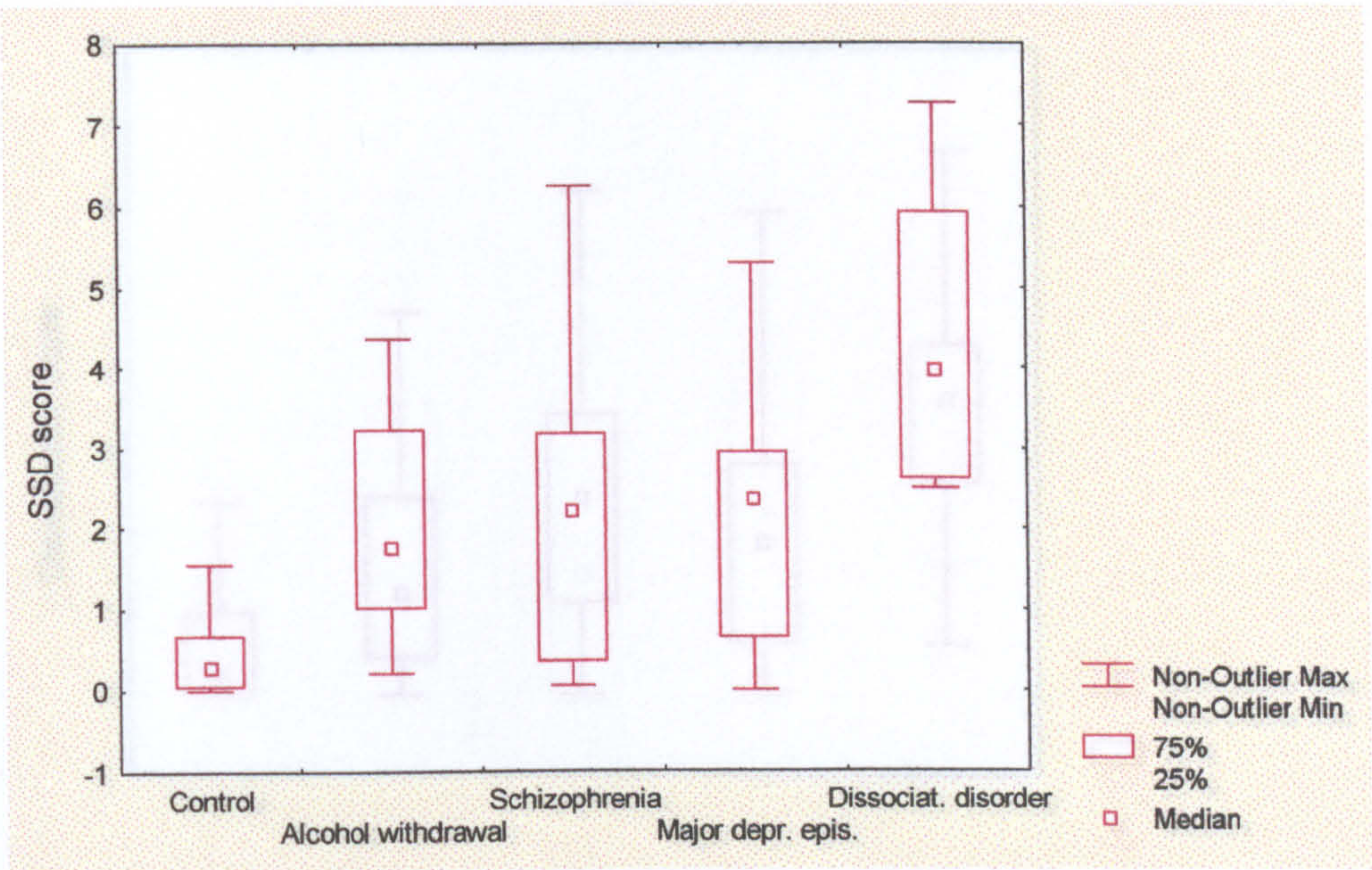
Internal consistency:	
<i>Subscale</i>	<i>Coefficient alpha</i>
Derealisation	.84
Depersonalisation	.91
Identity confusion	.93
Identity alteration	.87
Conversion	.92
Amnesia	.82
Hypermnesia	.90
Entire SSD	.97

Split-half reliability:	
Guttman split-half	.92
Equal length Spearman-Brown	.92



Figure 6.1.1 SSD scores across groups



Kruskal-Wallis test:

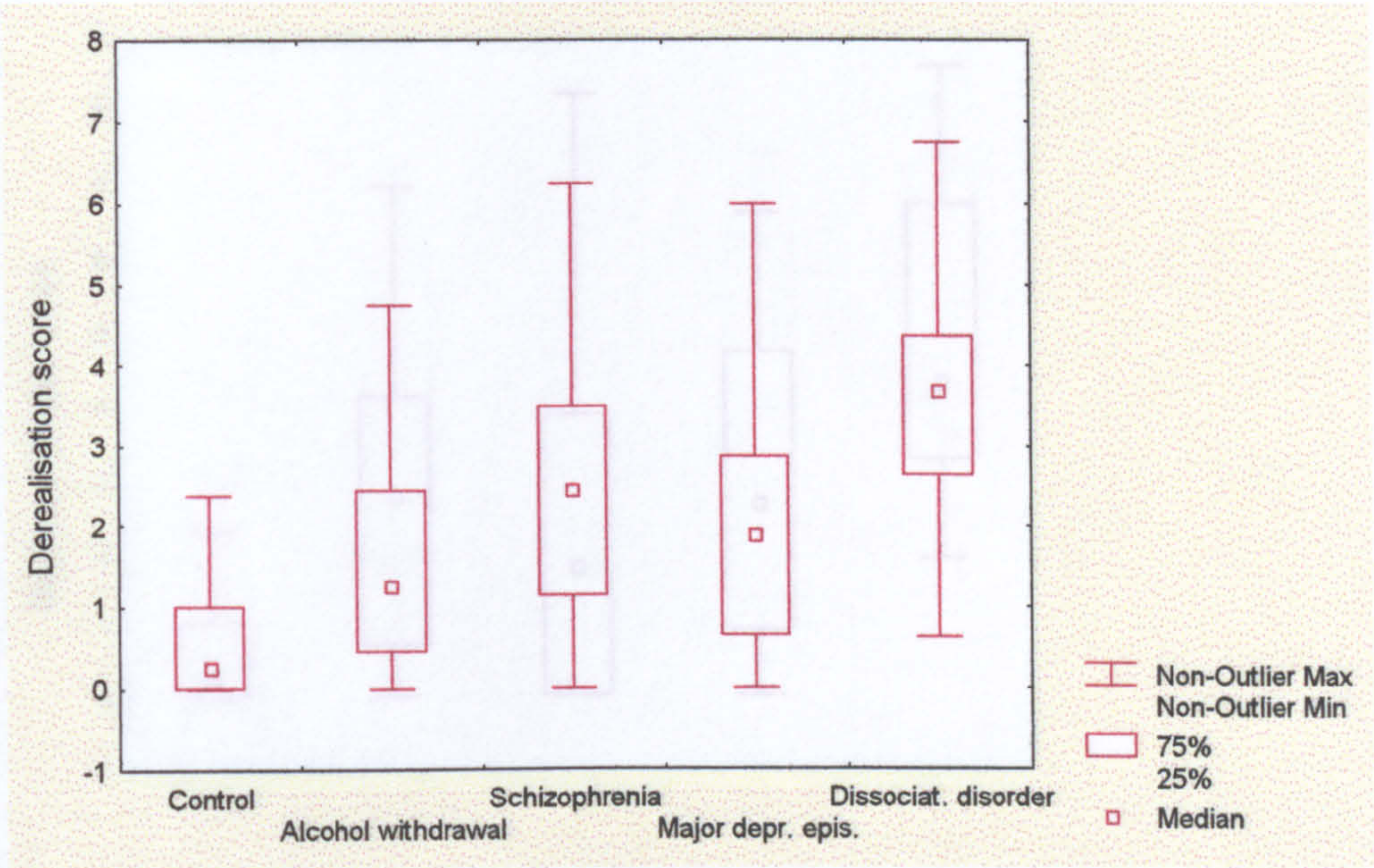
Ranks			
	Diagnosis	N	Mean Rank
SSD1 score	Control	63	41.14
	Alcohol withdrawal	20	87.90
	Schizophrenia	18	79.56
	Major depressive episode	19	82.97
	Dissociative disorder	10	115.65
	Total	130	

Test Statistics <sup>a,b</sup>	
	SSD1 score
Chi-Square	57.83
df	4
Asymp. Sig.	< 0.01

- a. Kruskal Wallis Test
- b. Grouping Variable: Diagnosis



Figure 6.1.2 Derealisation scores across groups



Kruskal-Wallis test:

Ranks			
Diagnosis		N	Mean Rank
Derealisation	Control	63	46.35
	Alcohol withdrawal	20	76.13
	Schizophrenia	18	84.39
	Major depressive episode	19	78.50
	Dissociative disorder	10	106.20
	Total	130	

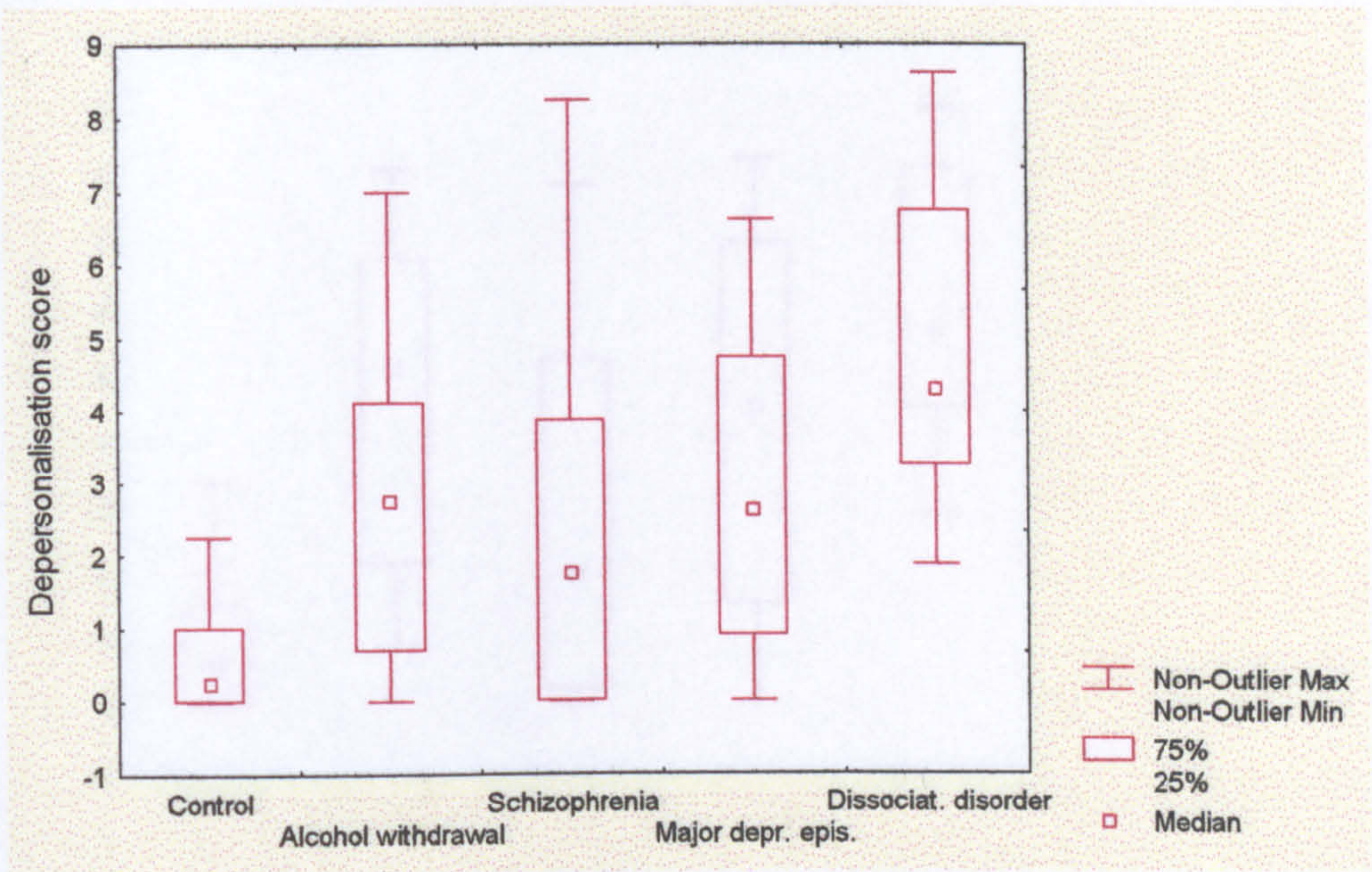
Test Statistics <sup>a,b</sup>	
	Derealisation
Chi-Square	37.15
df	4
Asymp. Sig.	< 0,01

a. Kruskal Wallis Test

b. Grouping Variable:  
Diagnosis



Figure 6.1.3 Depersonalisation scores across groups



Kruskal-Wallis test:

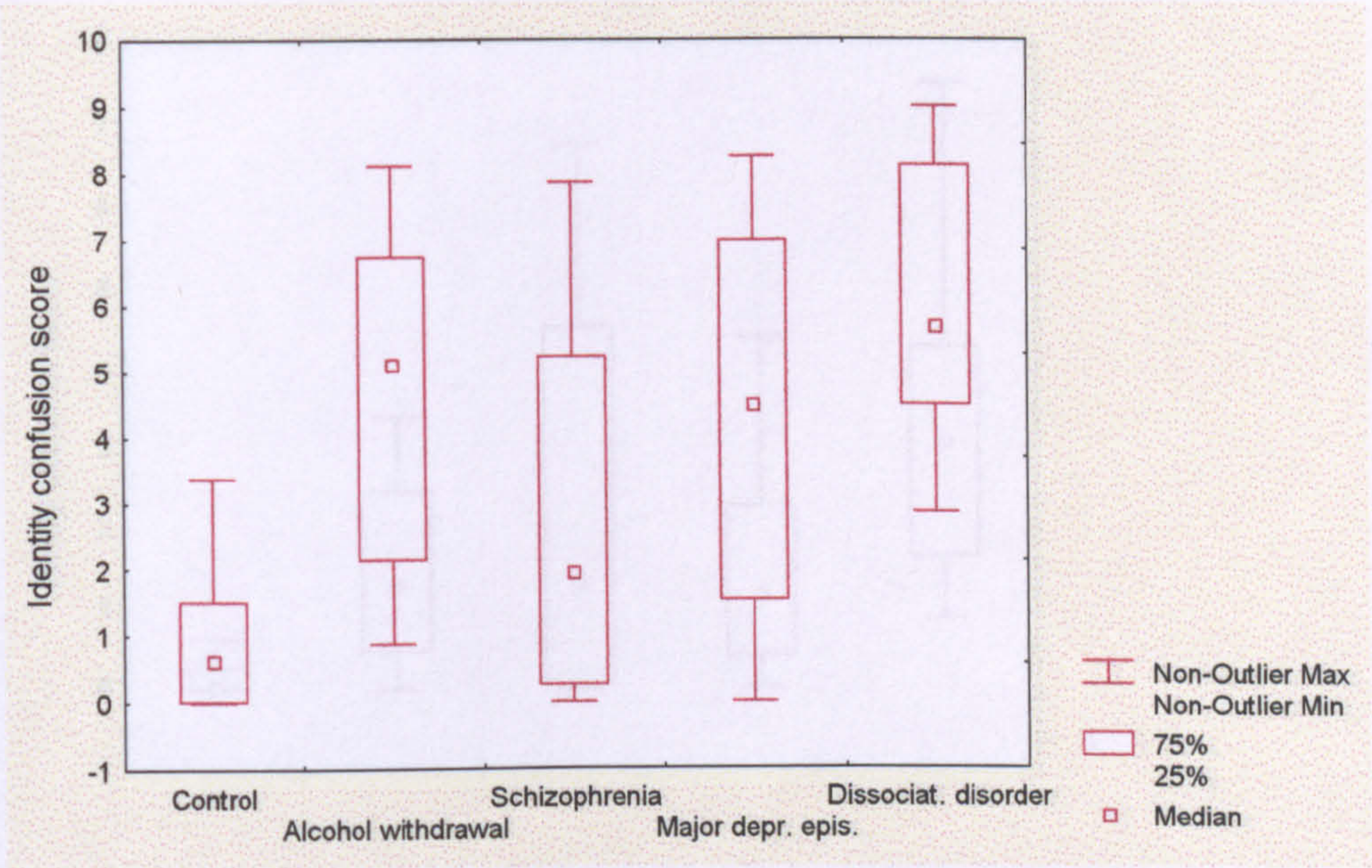
Ranks			
	Diagnosis	N	Mean Rank
Depersonalisation	Control	63	44.83
	Alcohol withdrawal	20	83.22
	Schizophrenia	18	72.64
	Major depressive episode	19	85.47
	Dissociative disorder	10	109.45
	Total	130	

Test Statistics <sup>a,b</sup>	
	Depersonalisation
Chi-Square	43.88
df	4
Asymp. Sig.	< 0.01

- a. Kruskal Wallis Test
- b. Grouping Variable: Diagnosis



Figure 6.1.4 Identity confusion scores across groups



Kruskal-Wallis test:

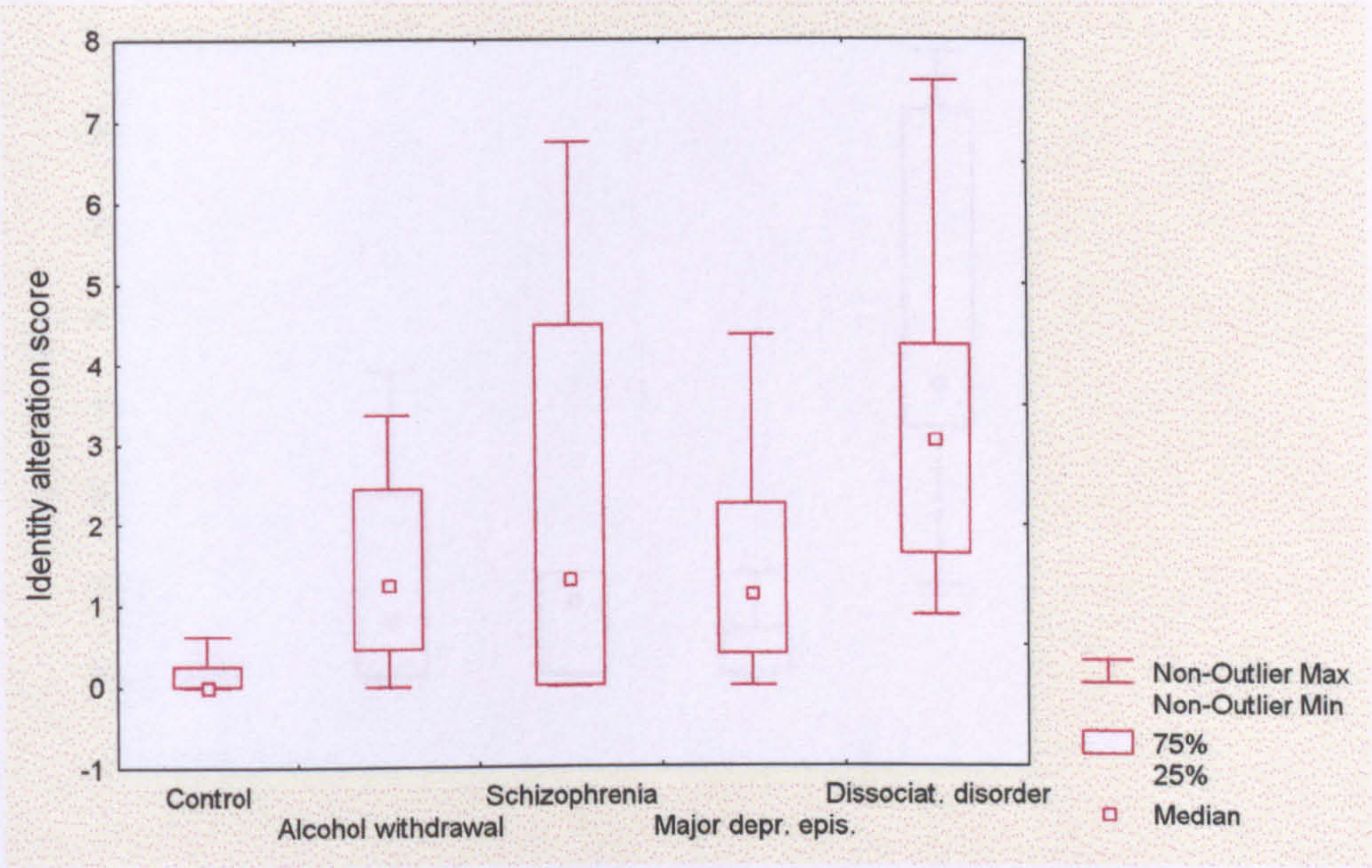
Ranks			
	Diagnosis	N	Mean Rank
Identity confusion	Control	63	44.05
	Alcohol withdrawal	20	93.65
	Schizophrenia	18	65.72
	Major depressive episode	19	84.97
	Dissociative disorder	10	106.95
	Total	130	

Test Statistics <sup>a,b</sup>	
	Identity confusion
Chi-Square	49.25
df	4
Asymp. Sig.	< 0.01

- a. Kruskal Wallis Test
- b. Grouping Variable: Diagnosis



Figure 6.1.5 Identity alteration scores across groups



Kruskal-Wallis test:

Ranks			
	Diagnosis	N	Mean Rank
Identity alteration	Control	63	44.10
	Alcohol withdrawal	20	82.53
	Schizophrenia	18	79.53
	Major depressive episode	19	82.16
	Dissociative disorder	10	109.40
	Total	130	

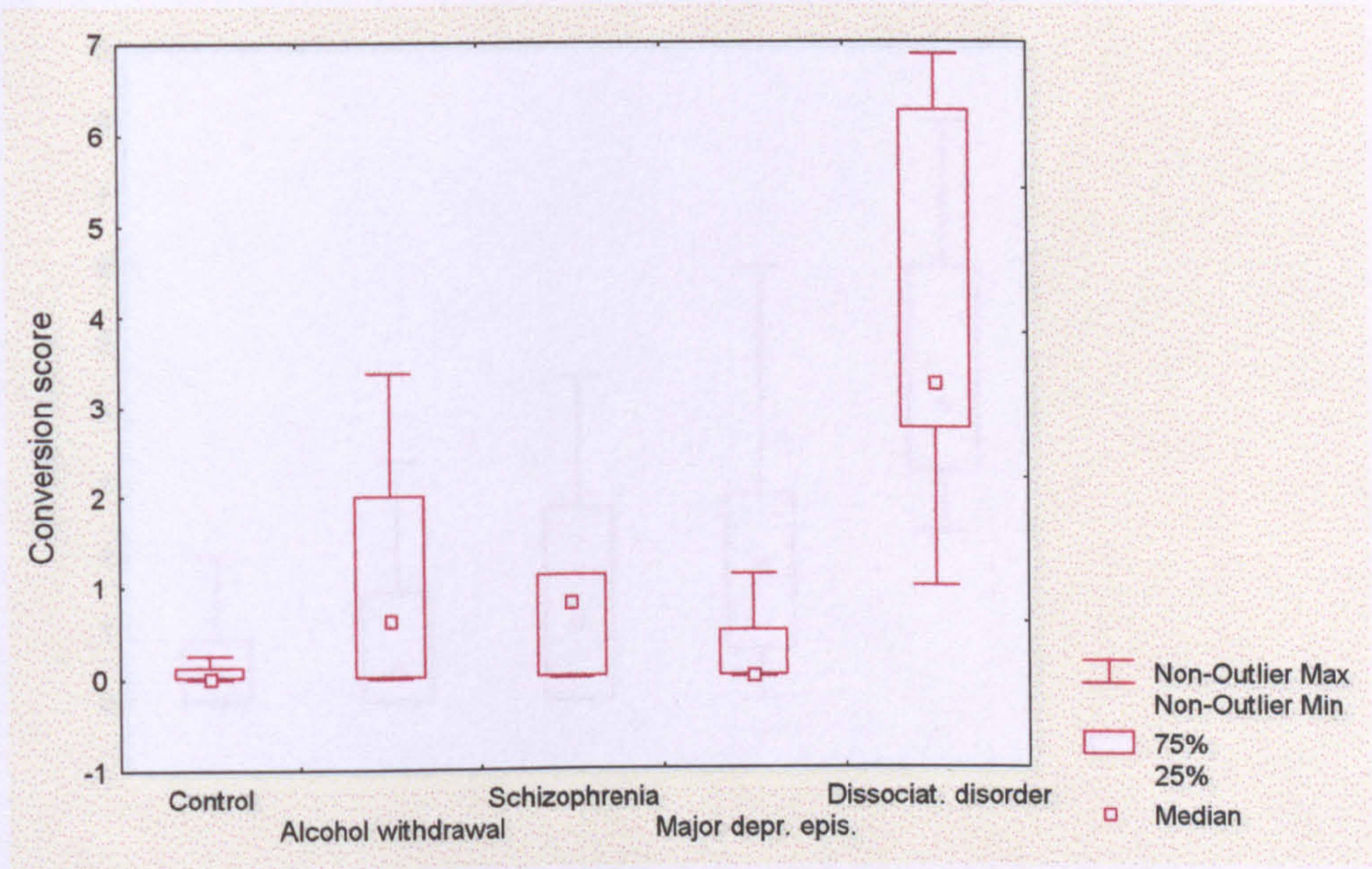
Test Statistics <sup>a,b</sup>	
	Identity alteration
Chi-Square	47.66
df	4
Asymp. Sig.	< 0,01

a. Kruskal Wallis Test

b. Grouping Variable: Diagnosis



Figure 6.1.6 Conversion scores across groups



Kruskal-Wallis test:

Ranks			
	Diagnosis	N	Mean Rank
Conversion	Control	63	49.90
	Alcohol withdrawal	20	76.90
	Schizophrenia	18	81.72
	Major depressive episode	19	62.24
	Dissociative disorder	10	118.00
	Total	130	

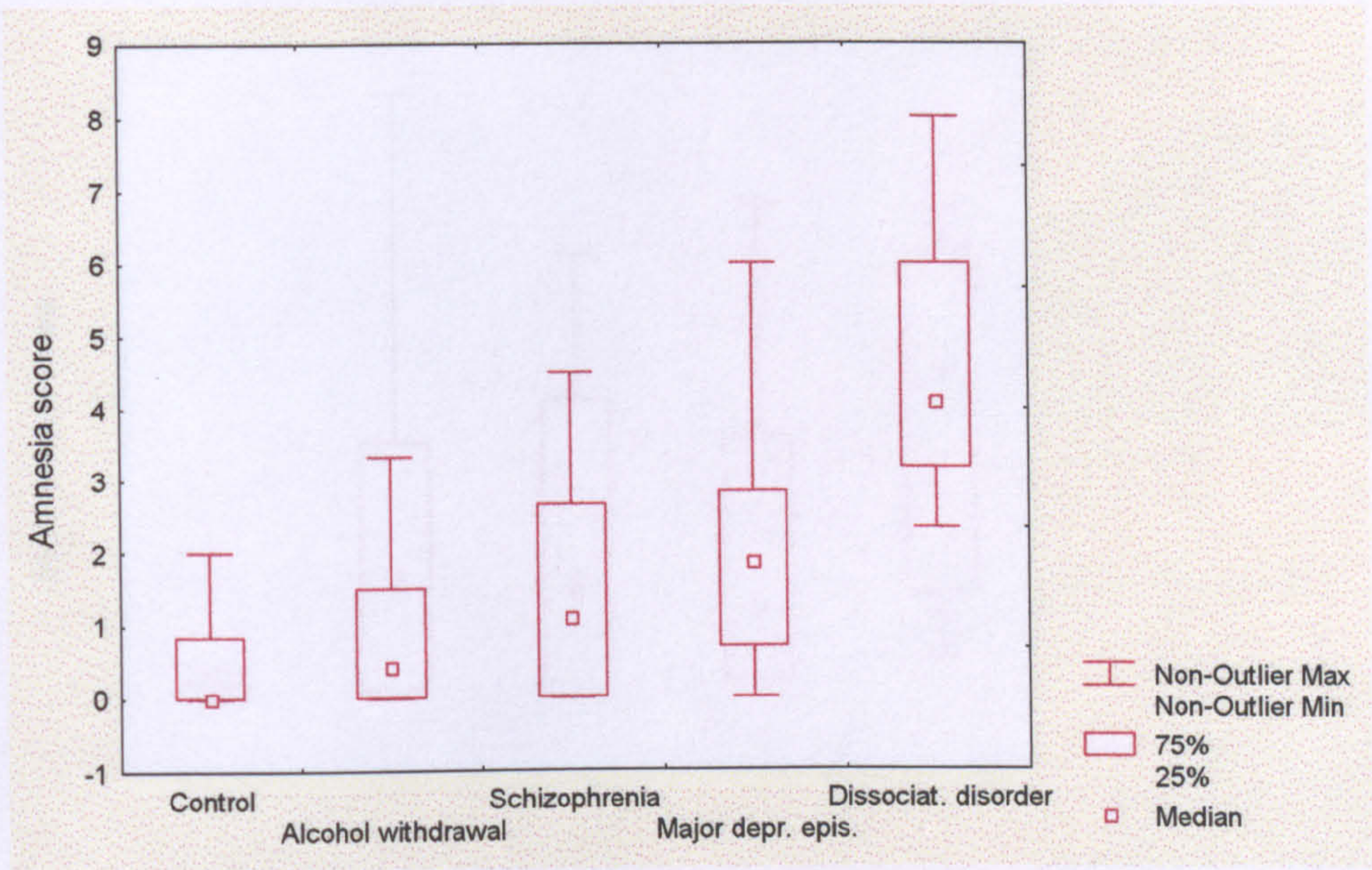
Test Statistics <sup>a,b</sup>	
Chi-Square	42.48
df	4
Asymp. Sig.	< 0.01

a. Kruskal Wallis

b. Grouping Variable:  
Diagnosis



Figure 6.1.7 Amnesia scores across groups



Kruskal-Wallis test:

Ranks			
	Diagnosis	N	Mean Rank
Amnesia	Control	63	49.64
	Alcohol withdrawal	20	61.97
	Schizophrenia	18	73.44
	Major depressive episode	19	85.82
	Dissociative disorder	10	119.55
	Total	130	

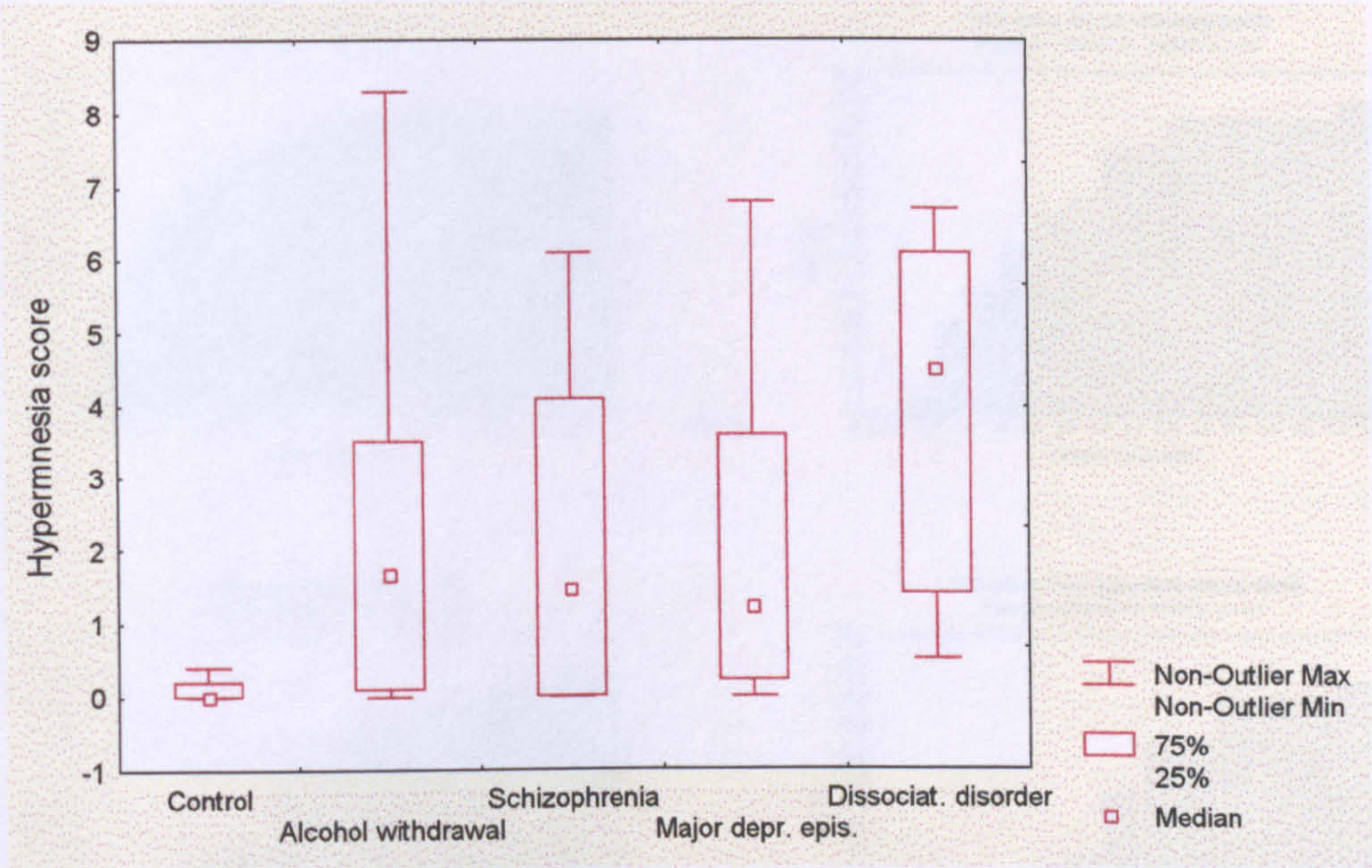
Test Statistics <sup>a,b</sup>	
	Amnesia
Chi-Square	40.31
df	4
Asymp. Sig.	< 0.01

a. Kruskal Wallis Test

b. Grouping Variable: Diagnosis



Figure 6.1.8 Hypermnesia scores across groups



Kruskal-Wallis test:

Ranks			
	Diagnosis	N	Mean Rank
Hypermnesia	Control	63	44.08
	Alcohol withdrawal	20	82.75
	Schizophrenia	18	80.00
	Major depressive episode	19	81.21
	Dissociative disorder	10	110.00
	Total	130	

Test Statistics <sup>a,b</sup>	
	Hypermnesia
Chi-Square	48.36
df	4
Asymp. Sig.	< 0.01

- a. Kruskal Wallis Test
- b. Grouping Variable: Diagnosis



Figure 6.2 Distribution fitting to SSD score for each diagnostic group

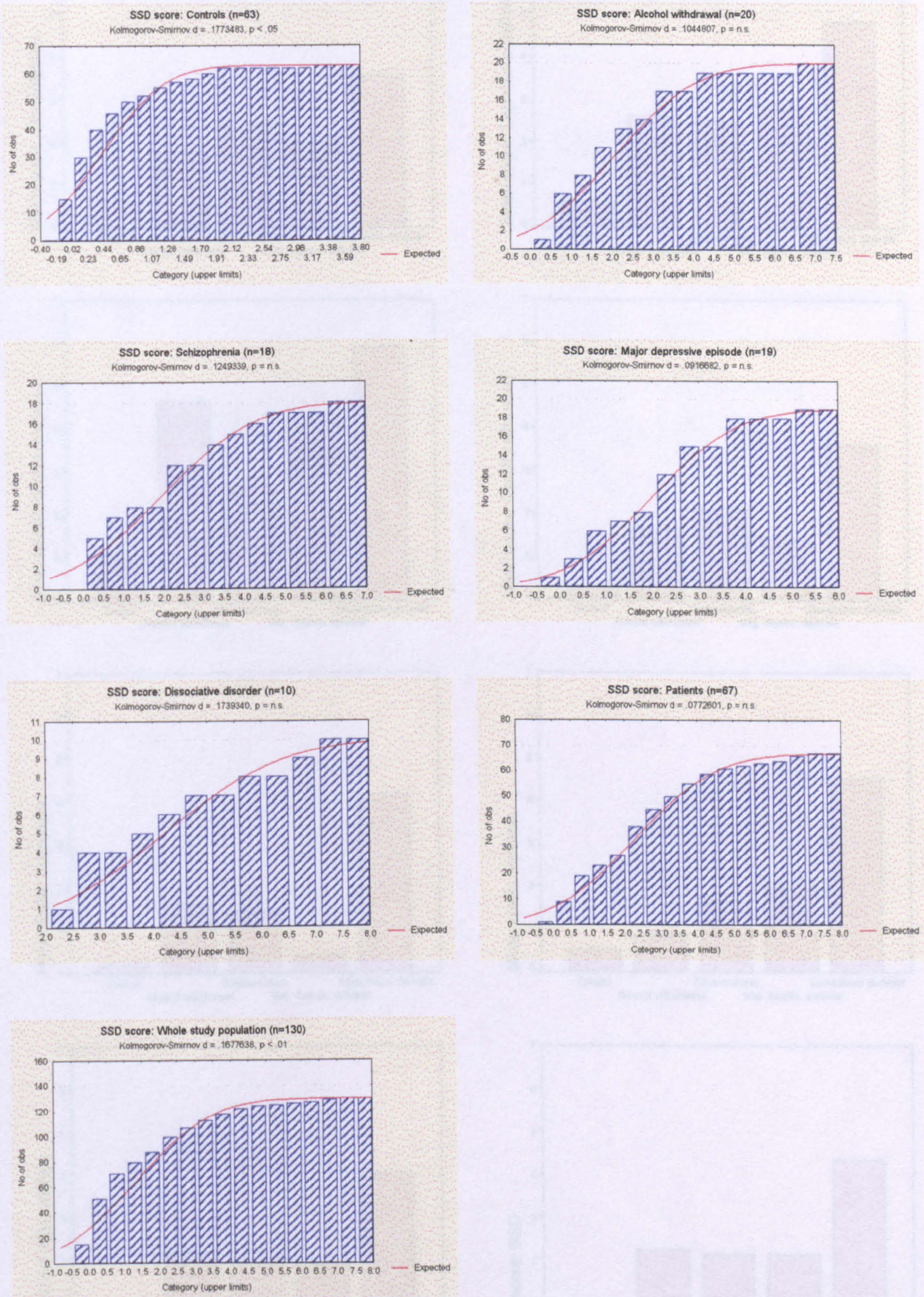




Figure 6.3.1 Mean SSD subscale scores for each diagnostic group

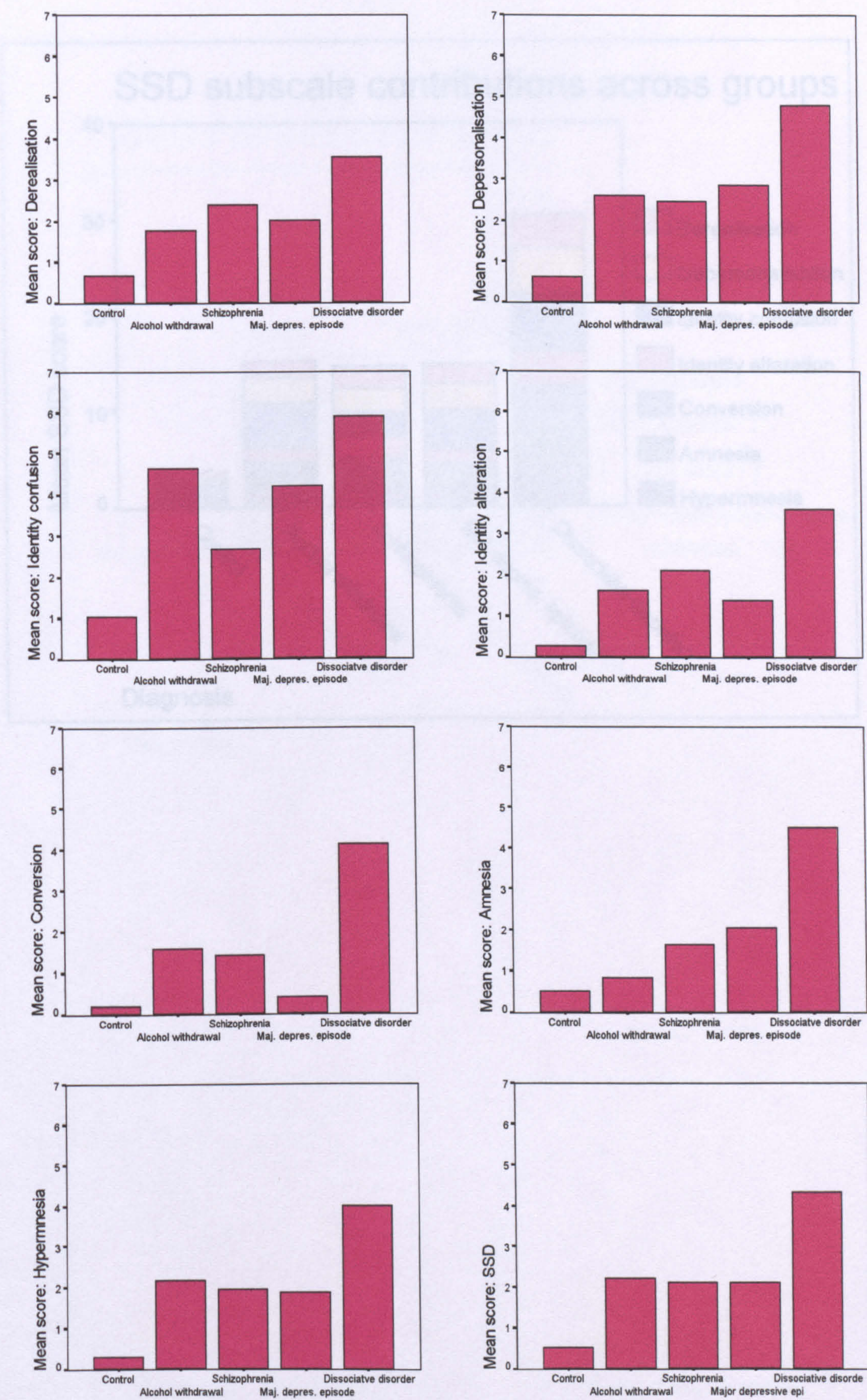




Figure 6.3.2 SSD and other routes

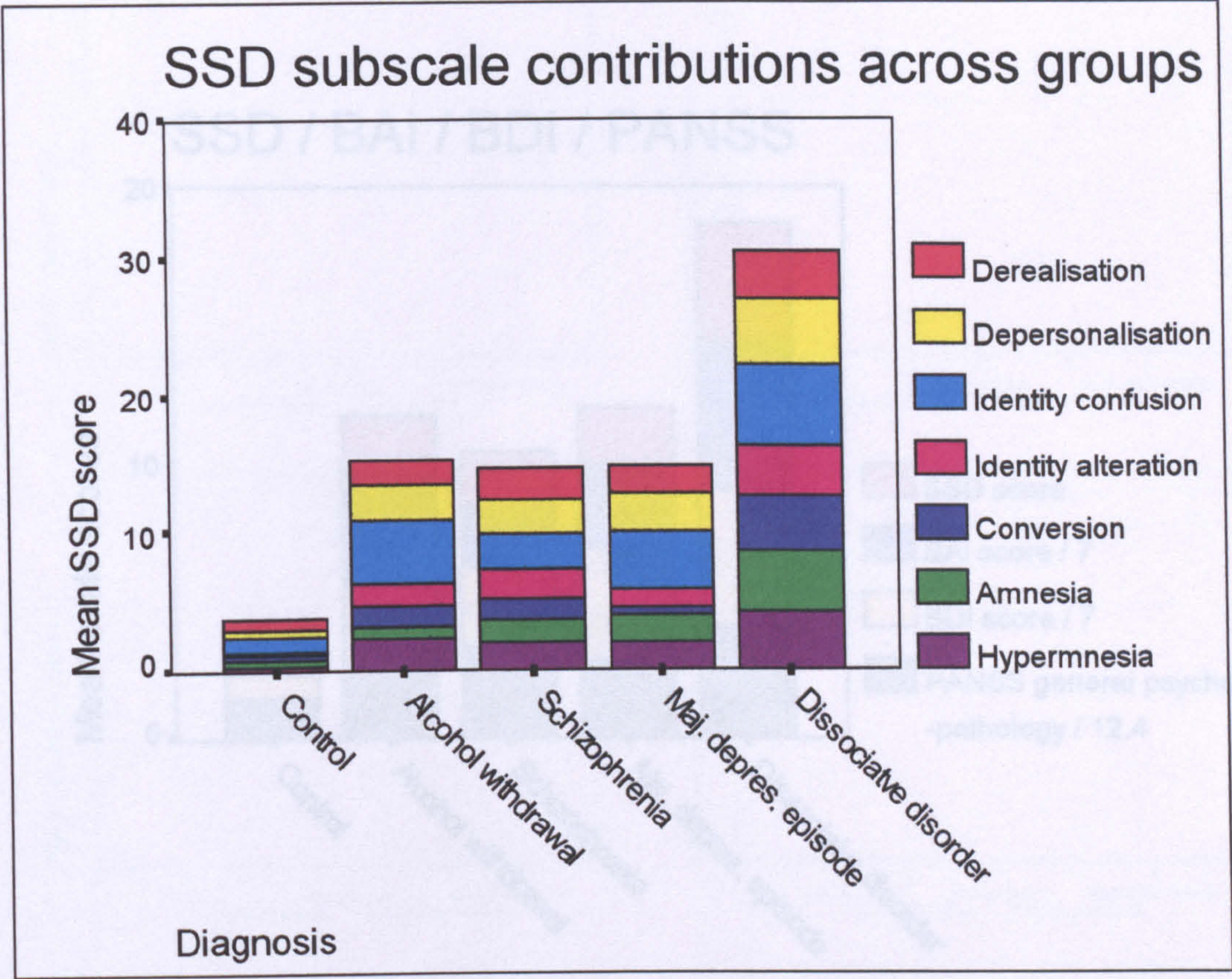




Figure 6.4 SSD and other scales

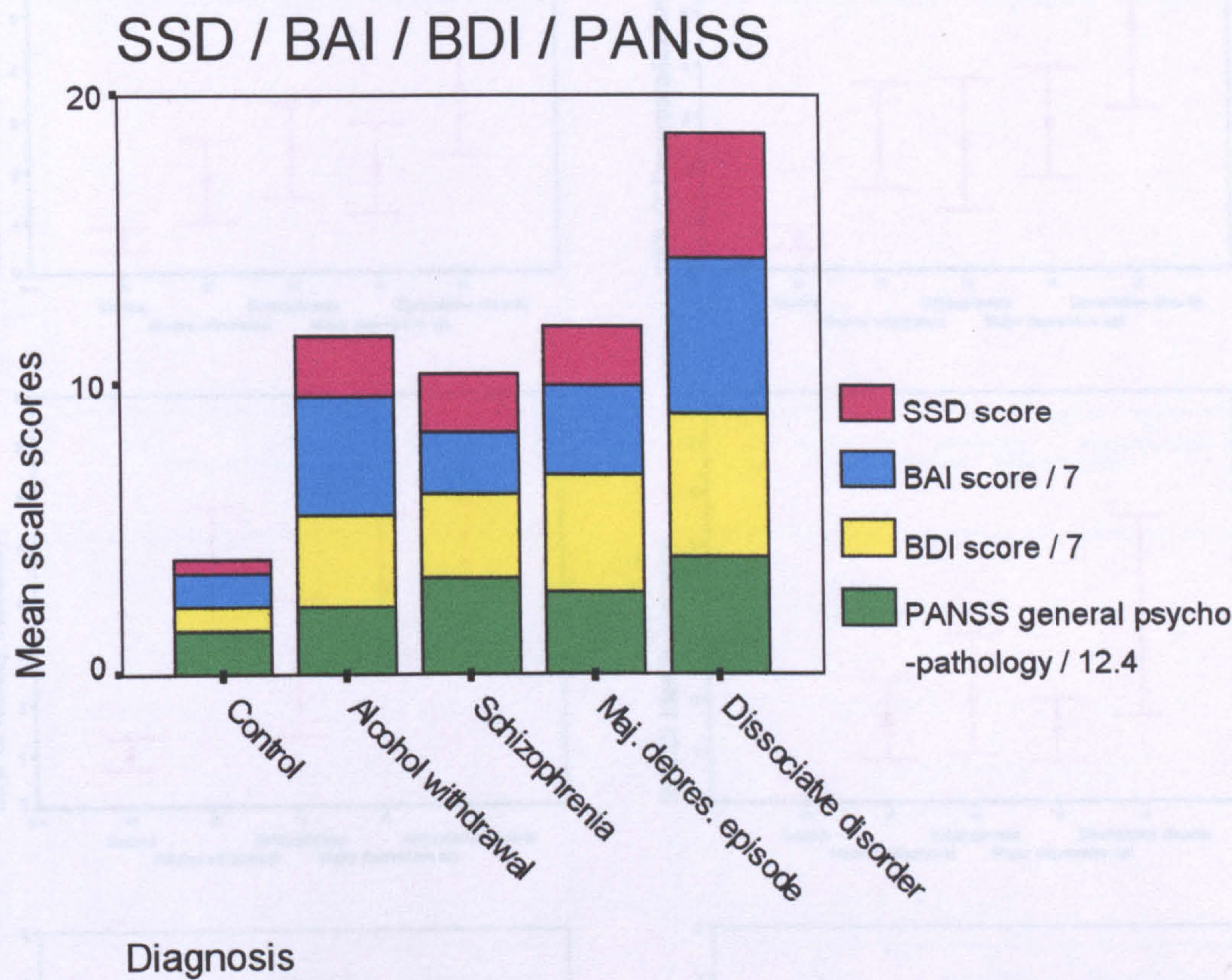




Figure 6.5.1 Confidence intervals: SSD and subscale scores across groups

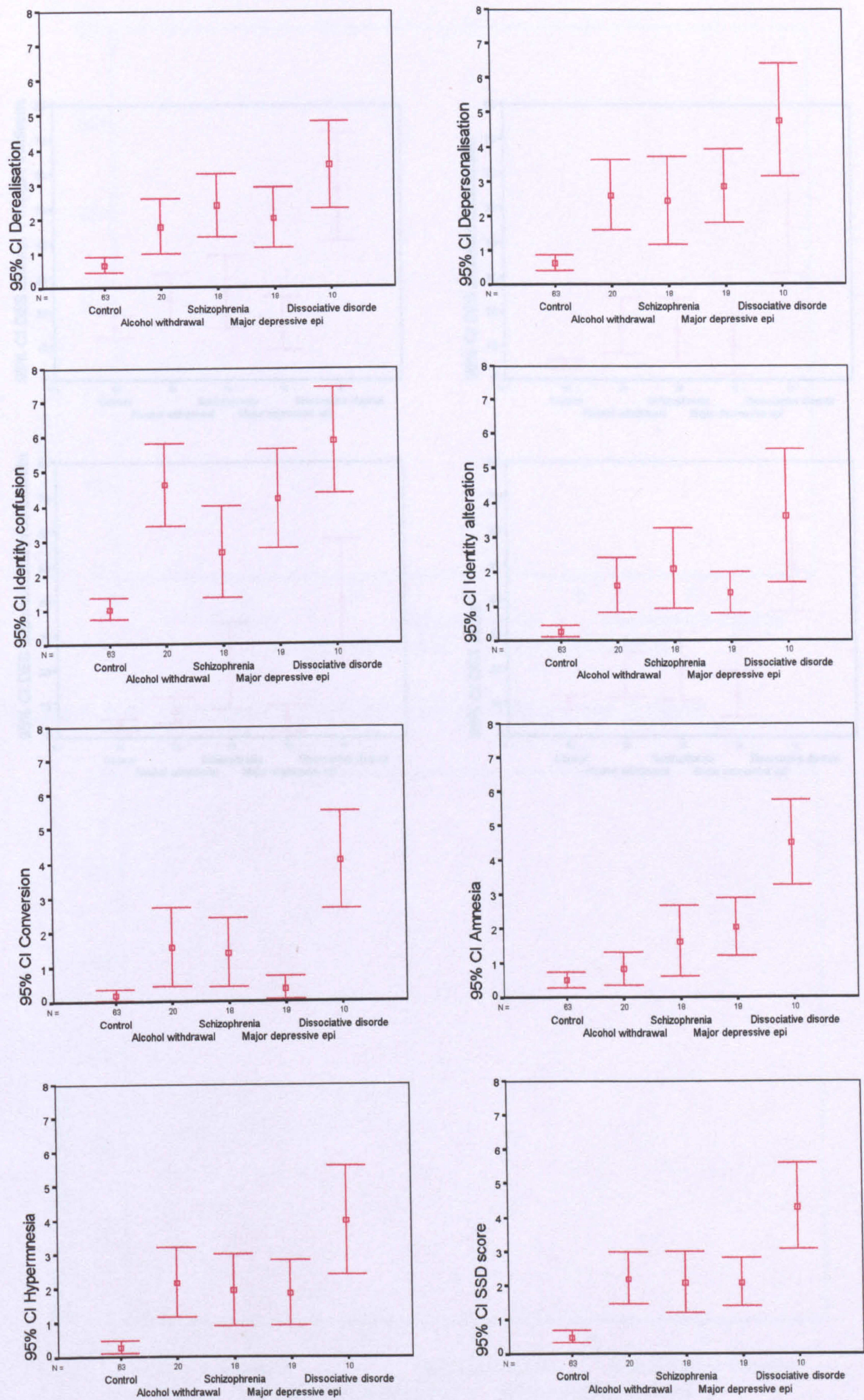
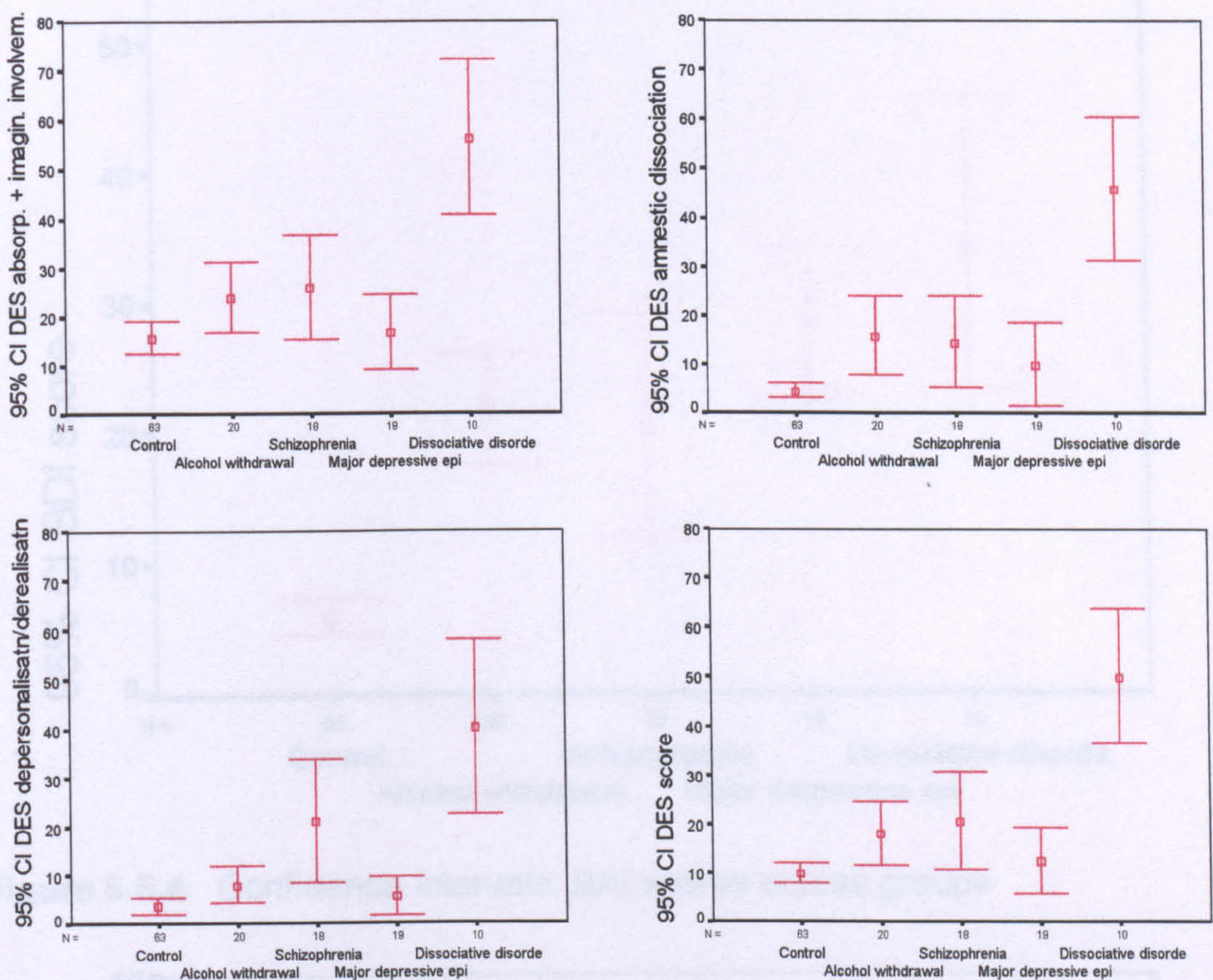


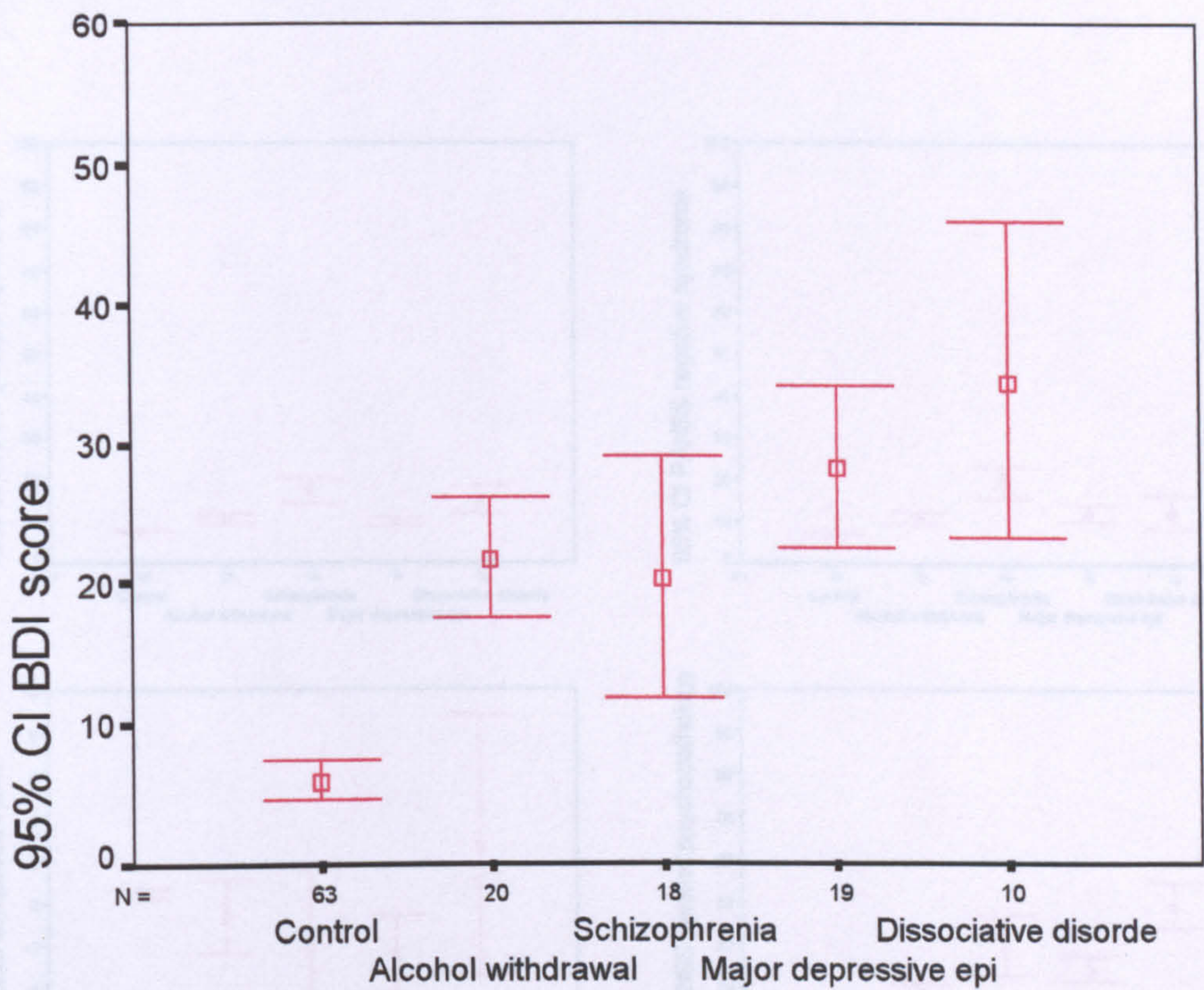


Figure 6.5.2 Confidence intervals: DES scores across groups





**Figure 6.5.3** Confidence intervals: BDI scores across groups



**Figure 6.5.4** Confidence intervals: BAI scores across groups

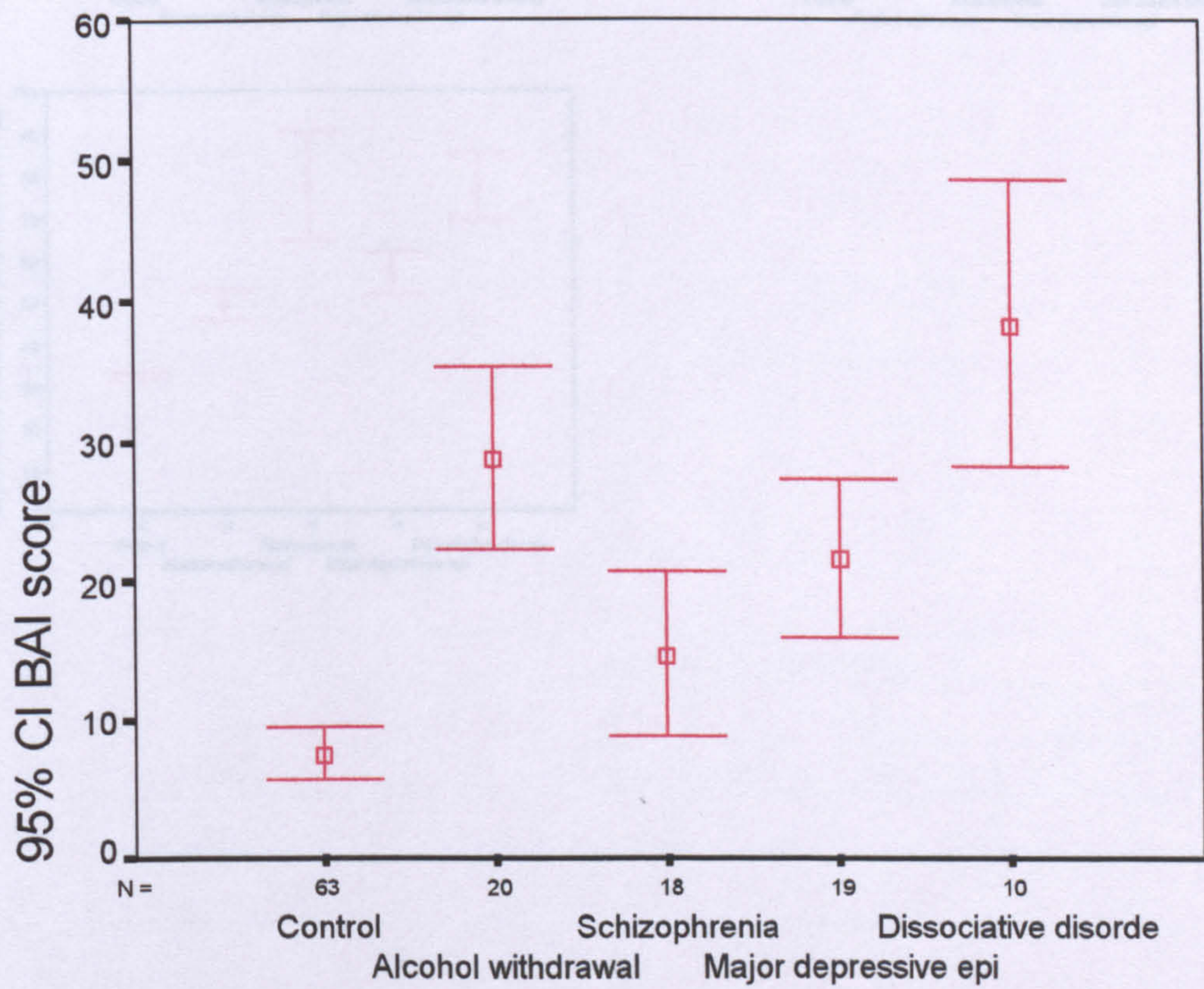




Figure 6.5.5 Confidence intervals: PANSS subscale scores across groups

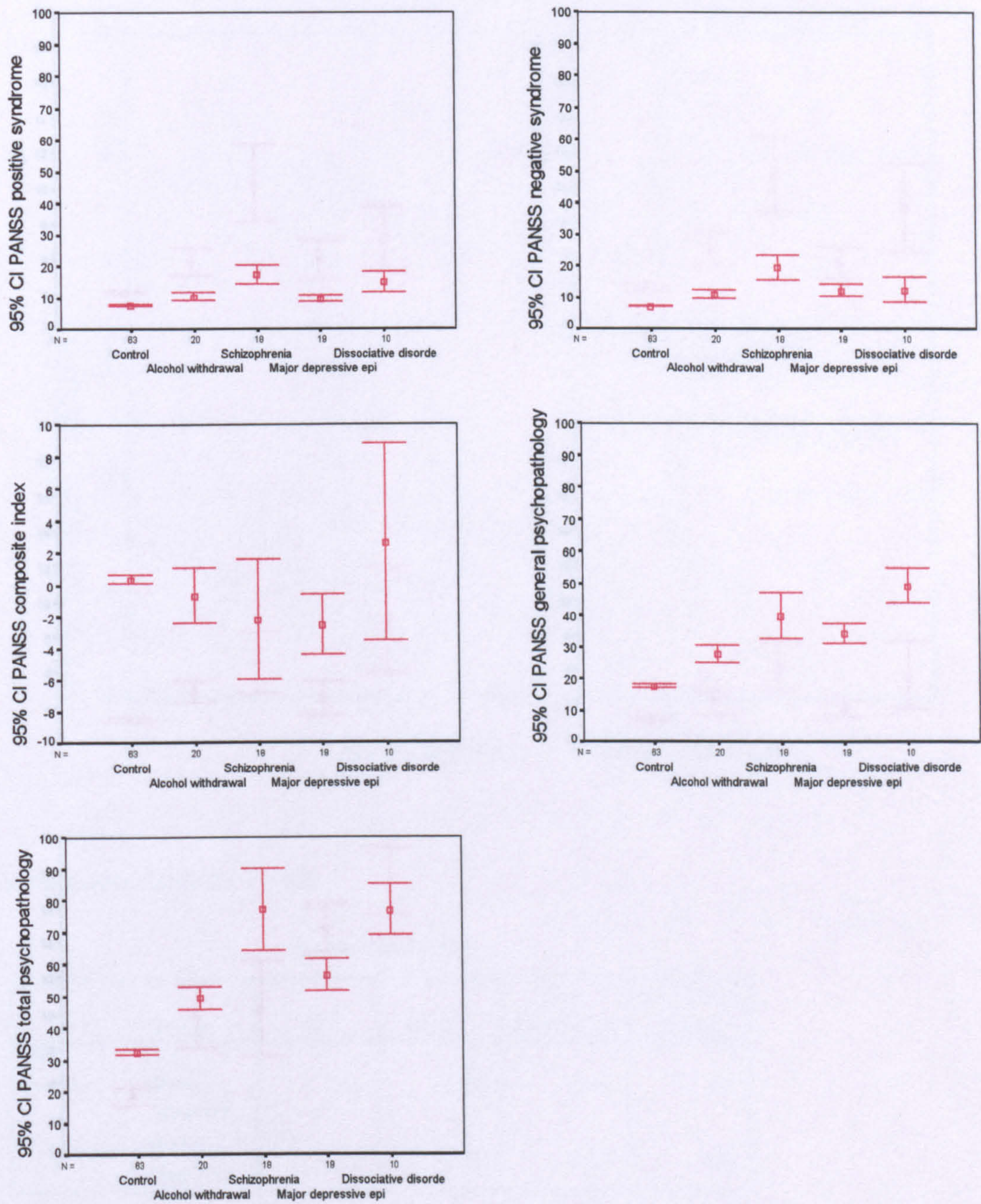
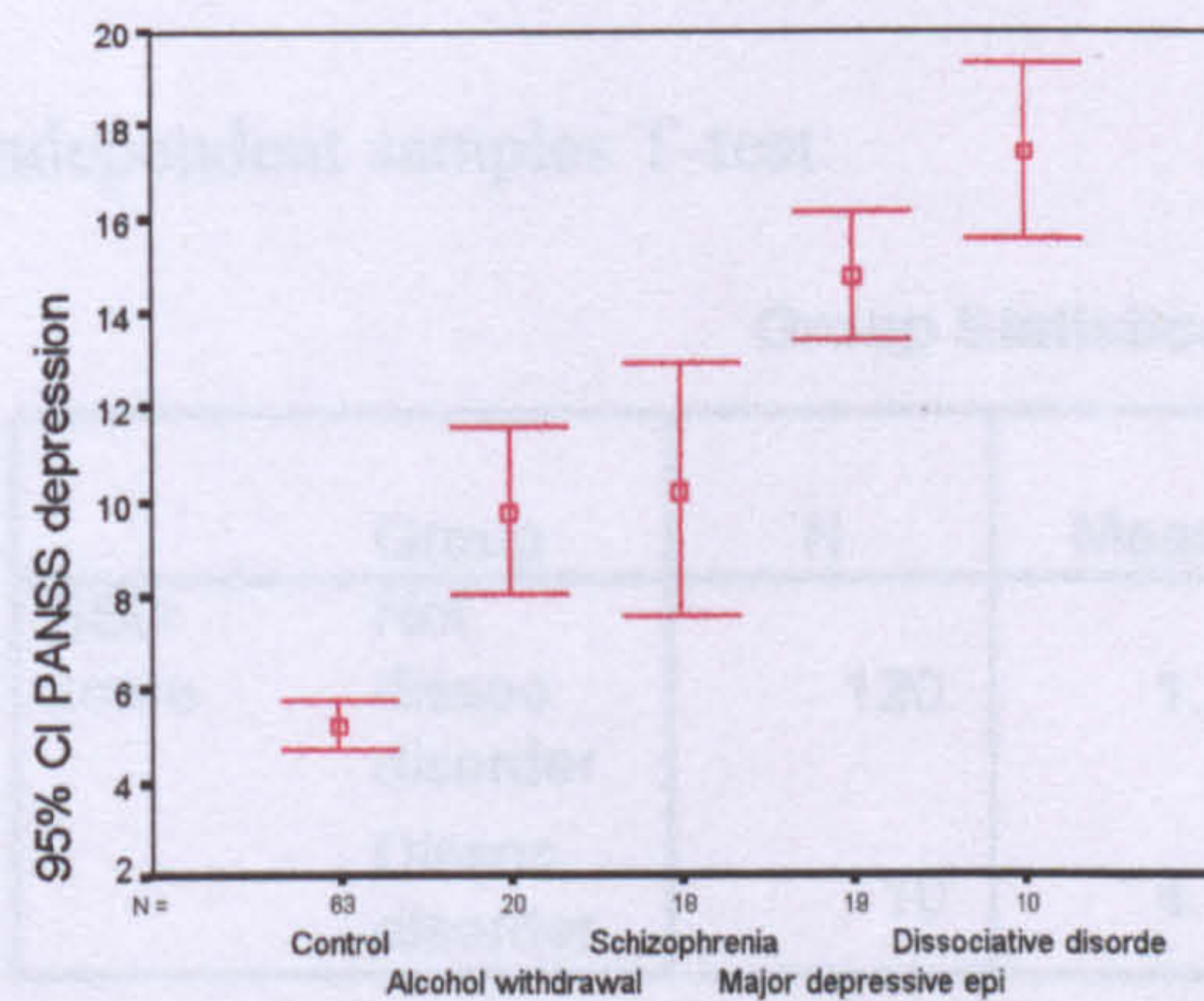
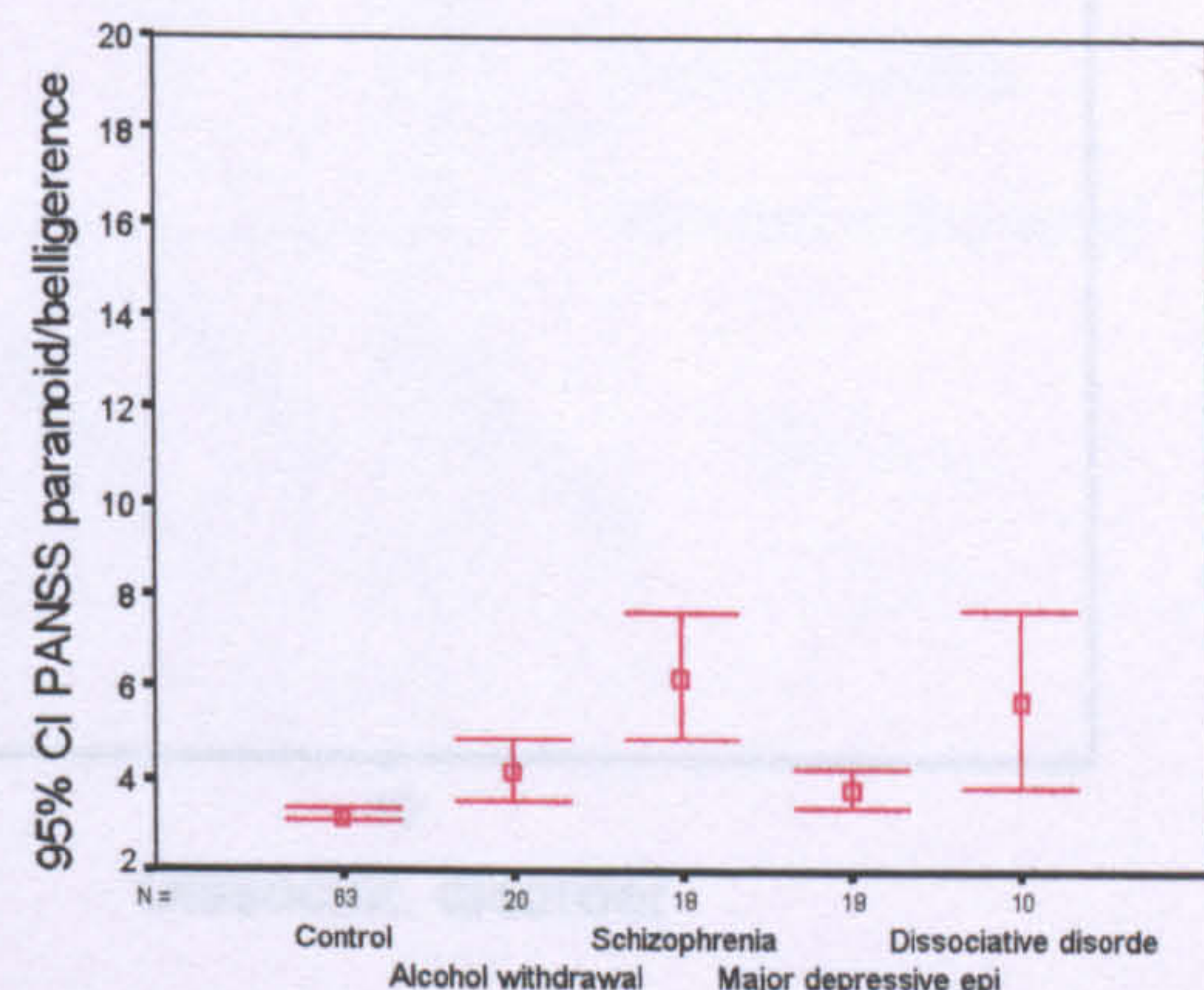
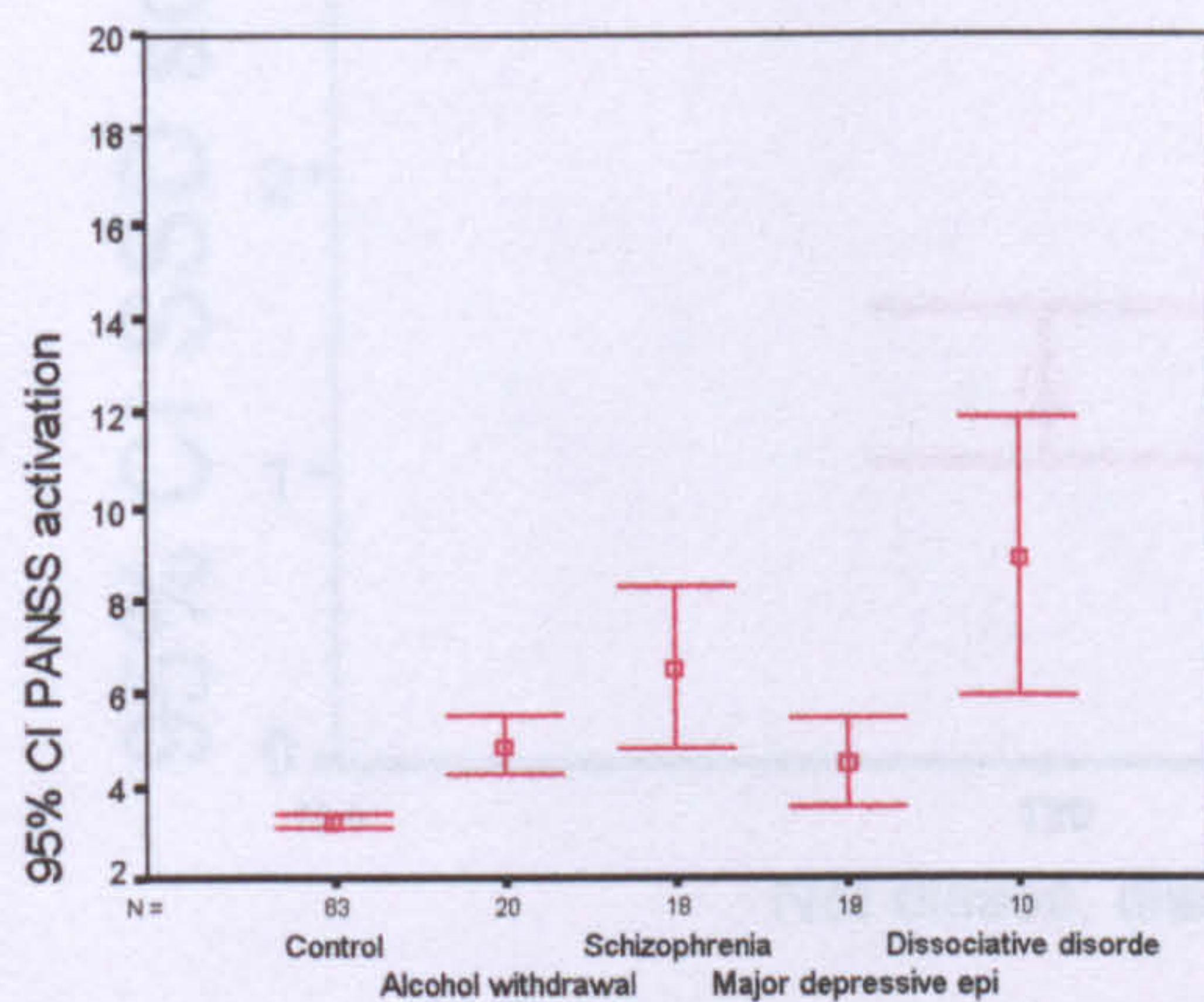
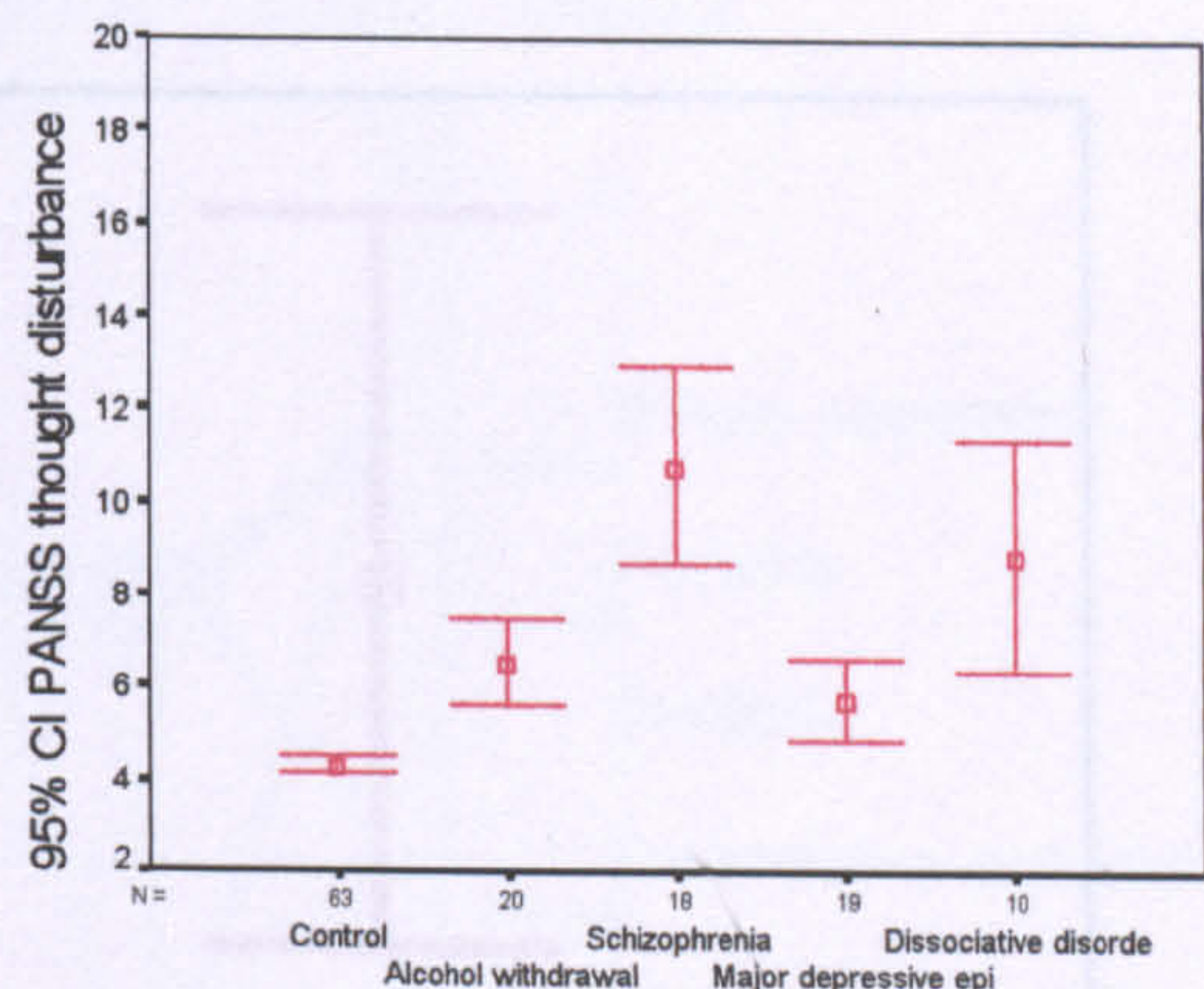
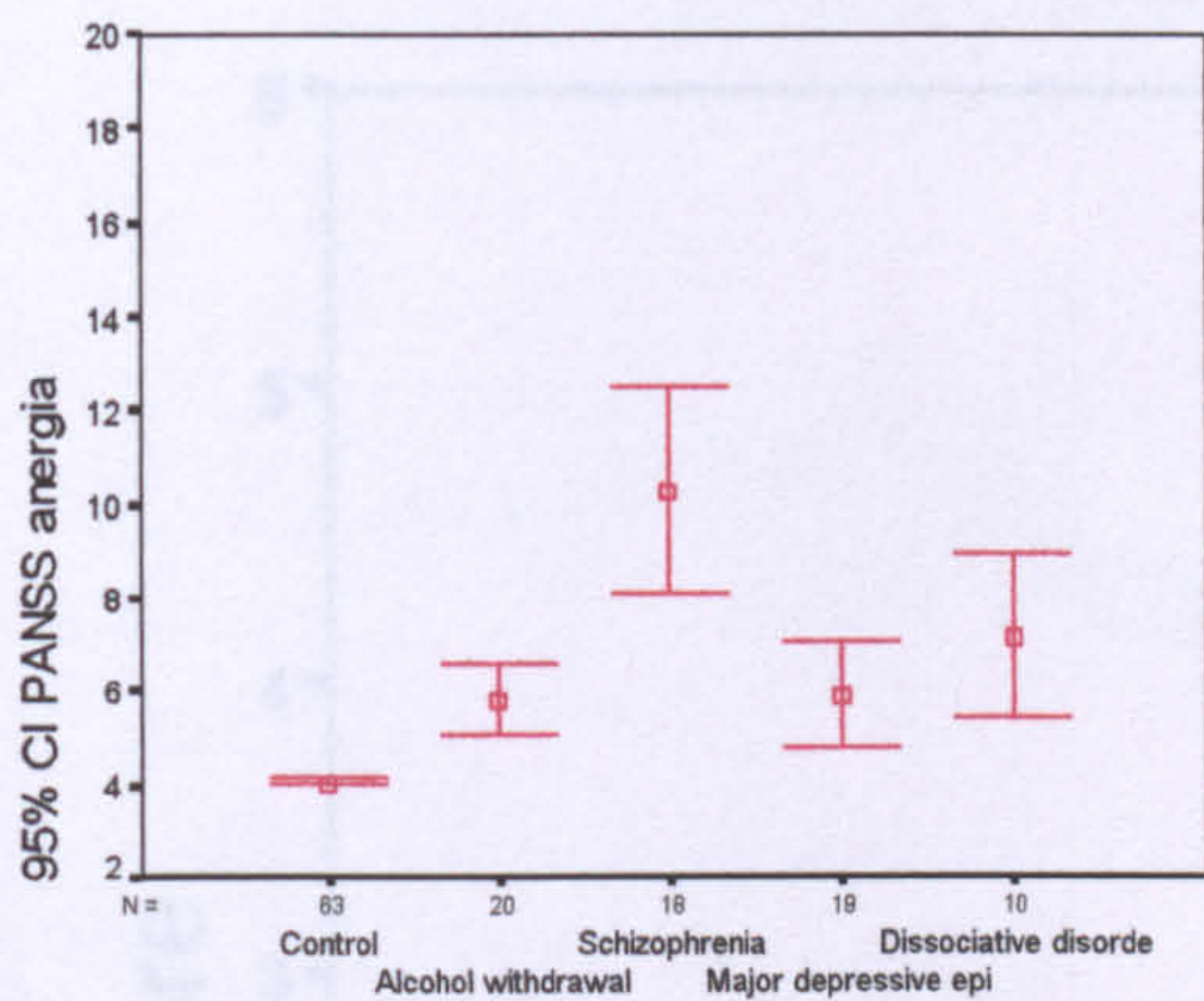




Figure 6.5.6 Confidence intervals: PANSS cluster scores across groups

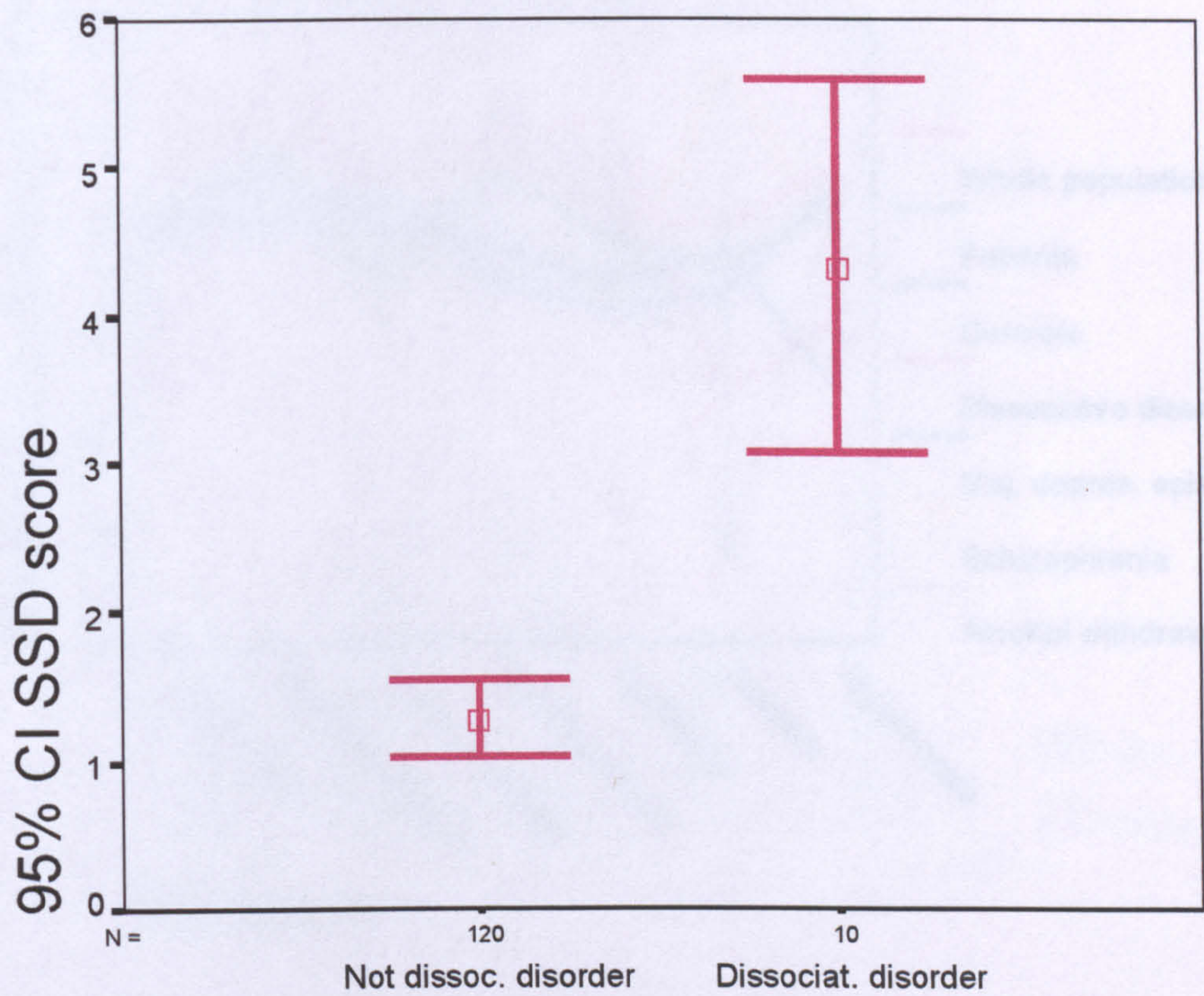
without a dissociative disorder



		Hypothesis Equality of Variances		F-test		t-test for Equality of Means		95% Confidence Interval of the Mean	
		Sig.		Mean Difference		Sig.		Lower	Upper
PANSS	Equal variances assumed	4.30	10.04	<.0001	-3.04	.57		-4.32	-1.76
	Unequal variances assumed								



**Figure 6.6.1** Comparison of SSD scores between those with and those without a dissociative disorder



Independent samples T-test:

**Group Statistics**

		N	Mean	Std. Deviation	Std. Error Mean
SSD score	Not dissociative disorder	120	1.29	1.45	.13
	Dissociative disorder	10	4.33	1.76	.56

		t-test for Equality of Means						
		t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Mean	
							Lower	Upper
SSD score	Equal variances not assumed	-5.30	10.04	< 0.001	-3.04	.57	-4.32	-1.76



Figure 6.6.2 Correlation of subscales with total SSD score

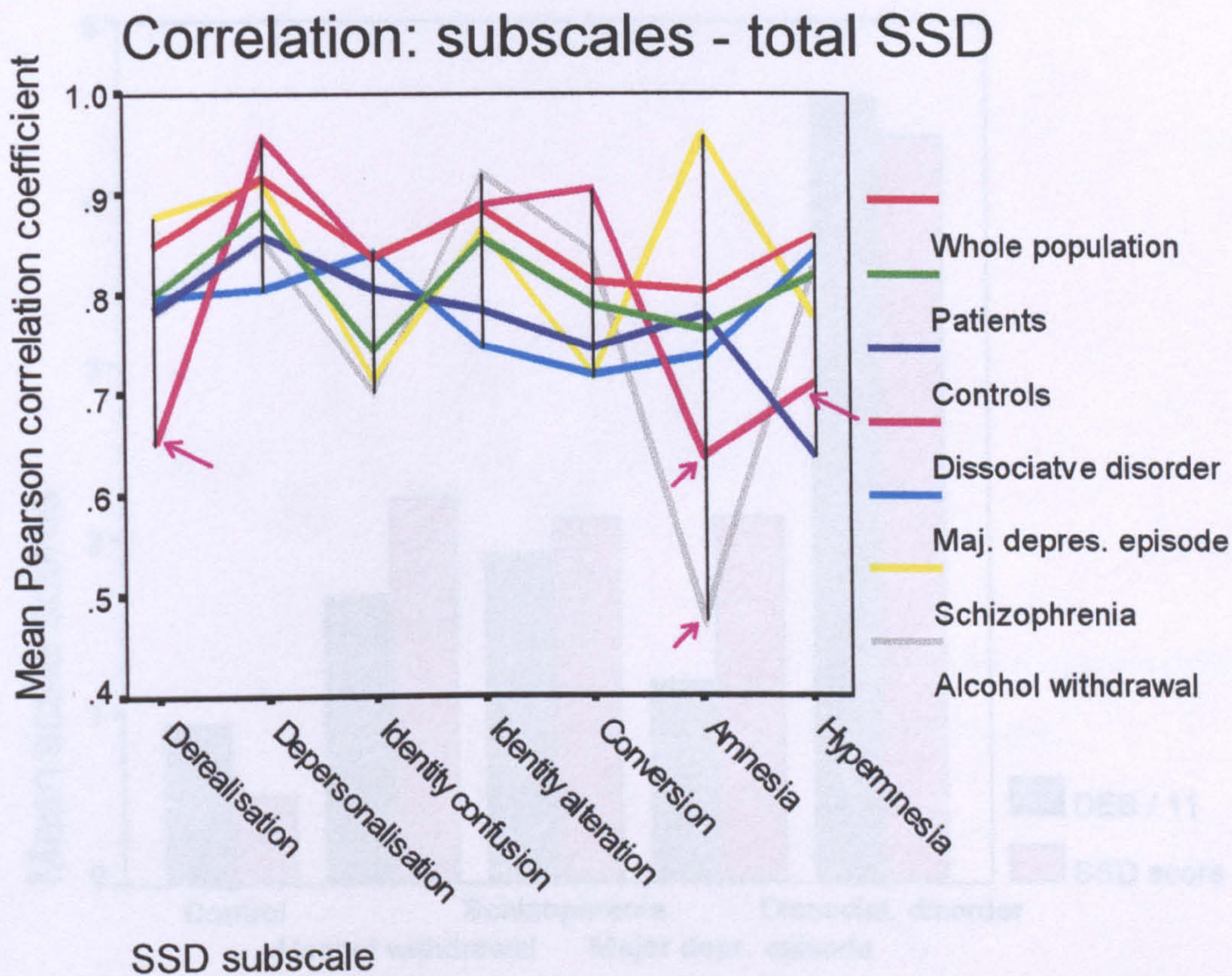
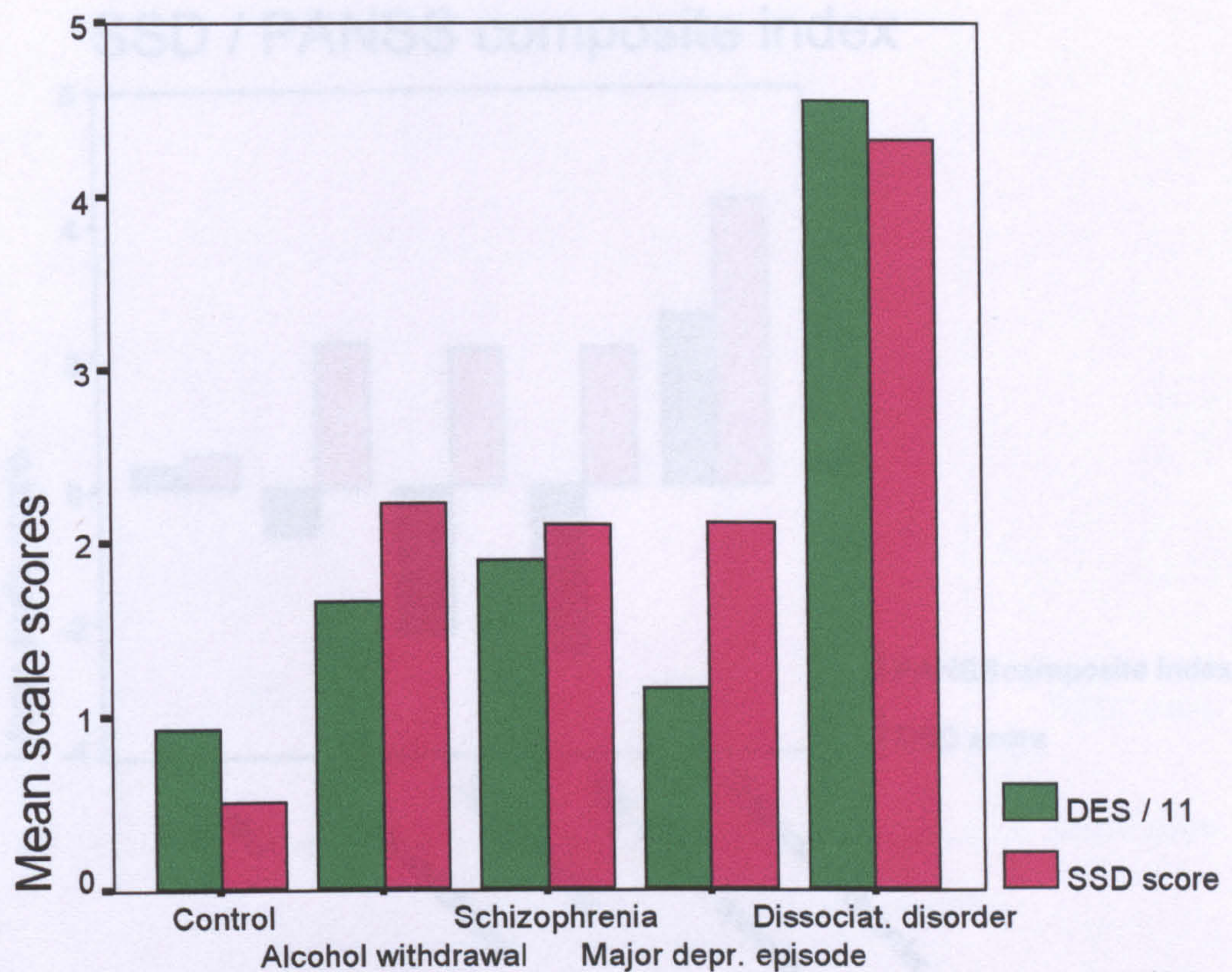


Table 6.6.2 Spearman's rho coefficients (correlations between SSD and DES scores)

Subscale	N	Correl. Coeff.	Sig. (2-tailed)
Amnesia	63	.568	< .001
Alcohol withdrawal	20	.423	.062
Schizophrenia	18	.744	< .001
Maj. depressive episode	19	.502	.027
Dissociative disorder	30	.806	.003



Figure 6.7.1 SSD and trait dissociation (DES)

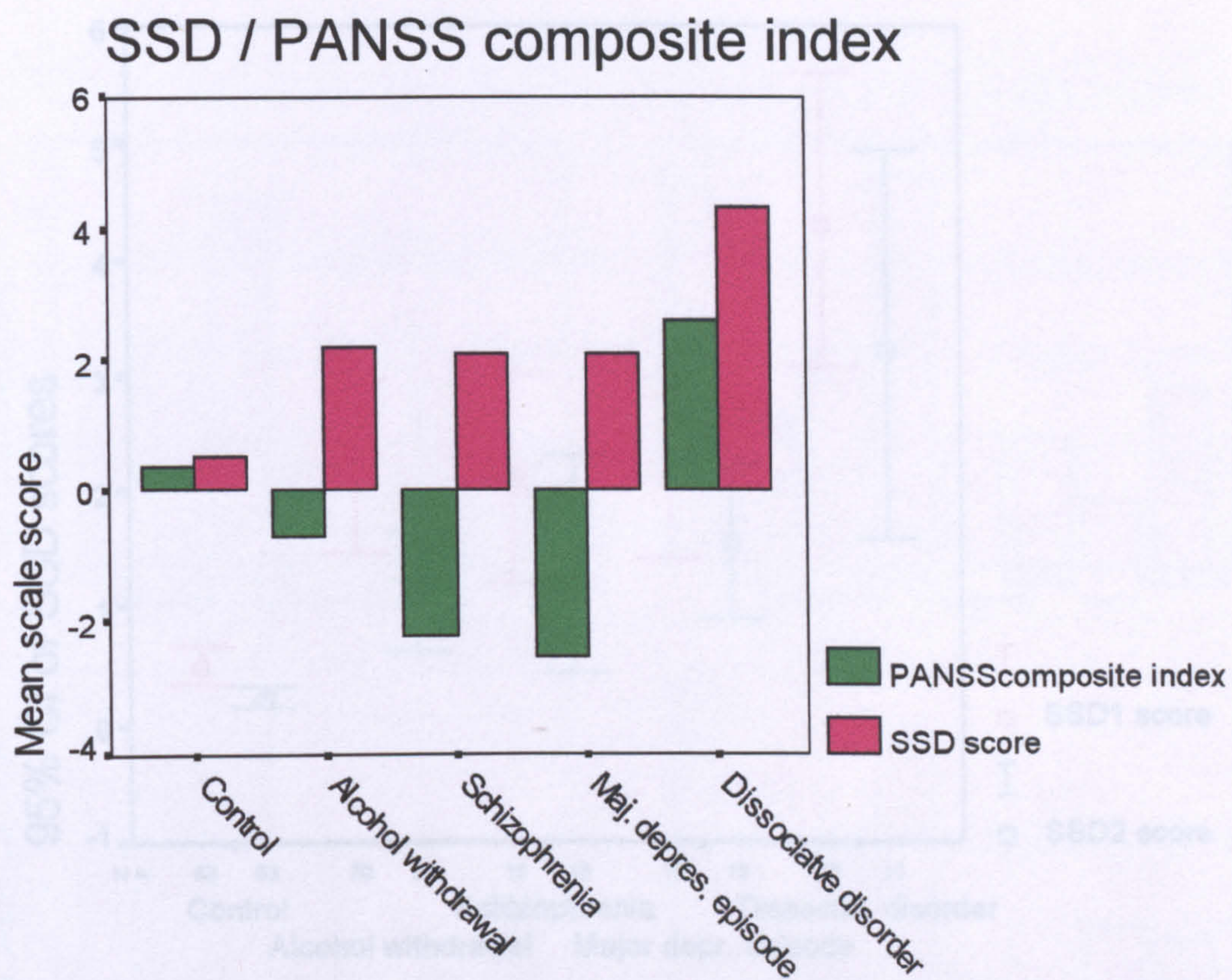


Spearman’s rho coefficients (correlation between SSD and DES scores):

Subgroup	N	Correl. Coeff.	Sig. (2-tailed)
Controls	63	.566	< .001
Alcohol withdrawal	20	.425	.062
Schizophrenia	18	.744	< .001
Major depressive episode	19	.507	.027
Dissociative disorder	10	.806	.005



Figure 6.7.2 SSD and positive symptoms



Mean length of period between SSD1 and SSD2 = 53 minutes

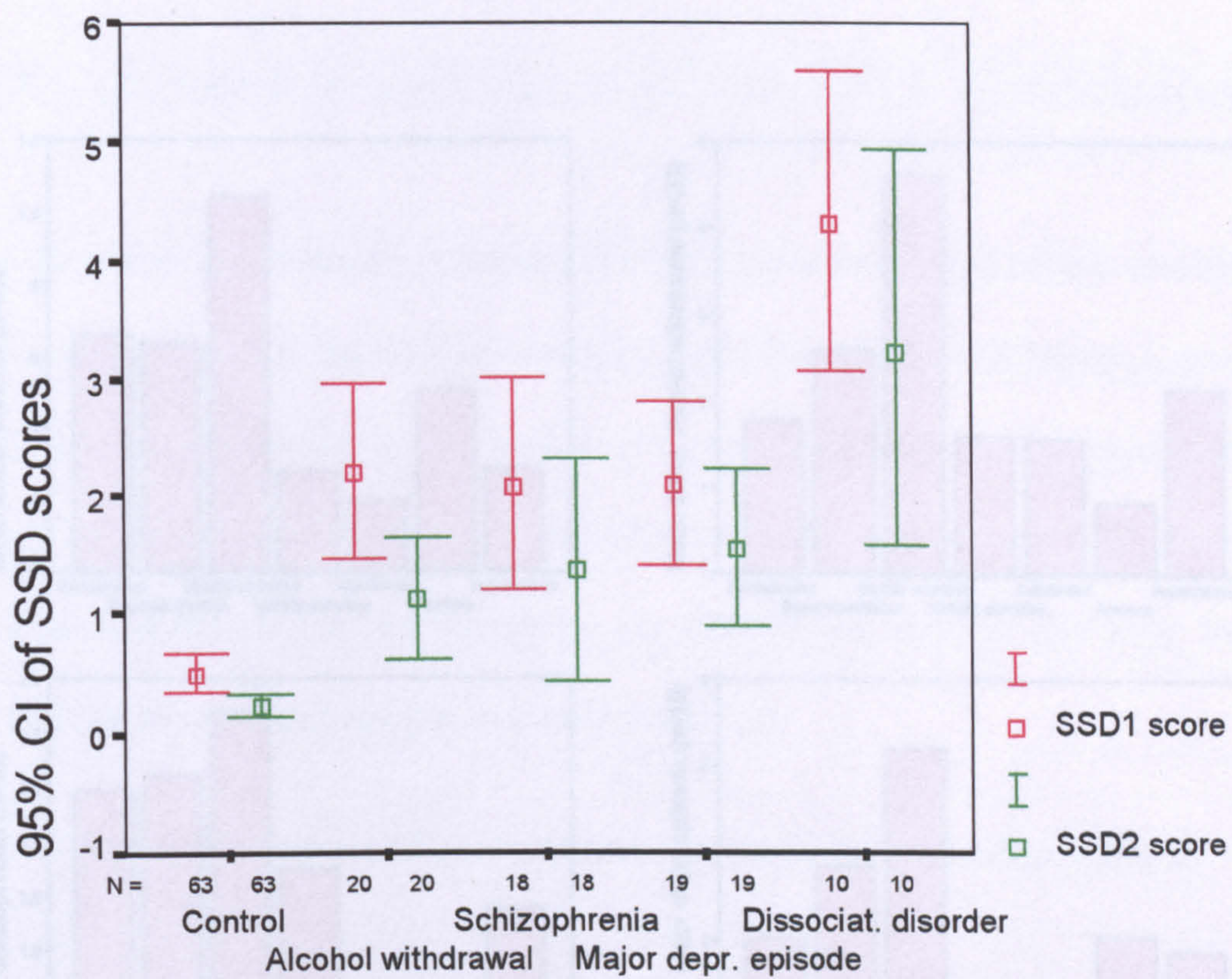
Paired-samples T-test to compare mean SSD scores:

Subgroup	95%CI-lower*	95%CI-upper*	t	df	Sig.(2-tailed)
Whole population	0.41	0.71	7.26	129	<0.001
Patients	0.59	1.08	6.77	66	<0.001
Controls	0.12	0.42	3.56	62	0.001
Alcohol withdrawal	0.61	1.56	4.51	19	<0.001
Major depr. episode	0.25	0.84	3.85	18	0.001
Schizophrenia	0.22	1.22	3.02	17	0.008
Dissociative disorder	0.01	2.13	2.29	9	0.048

\* The 95% lower and upper confidence intervals in the table refer to the 95% confidence intervals of the difference between the means.



Figure 6.8 Change in SSD scores during data collection



Mean length of period between SSD1 and SSD2 = 53 minutes.

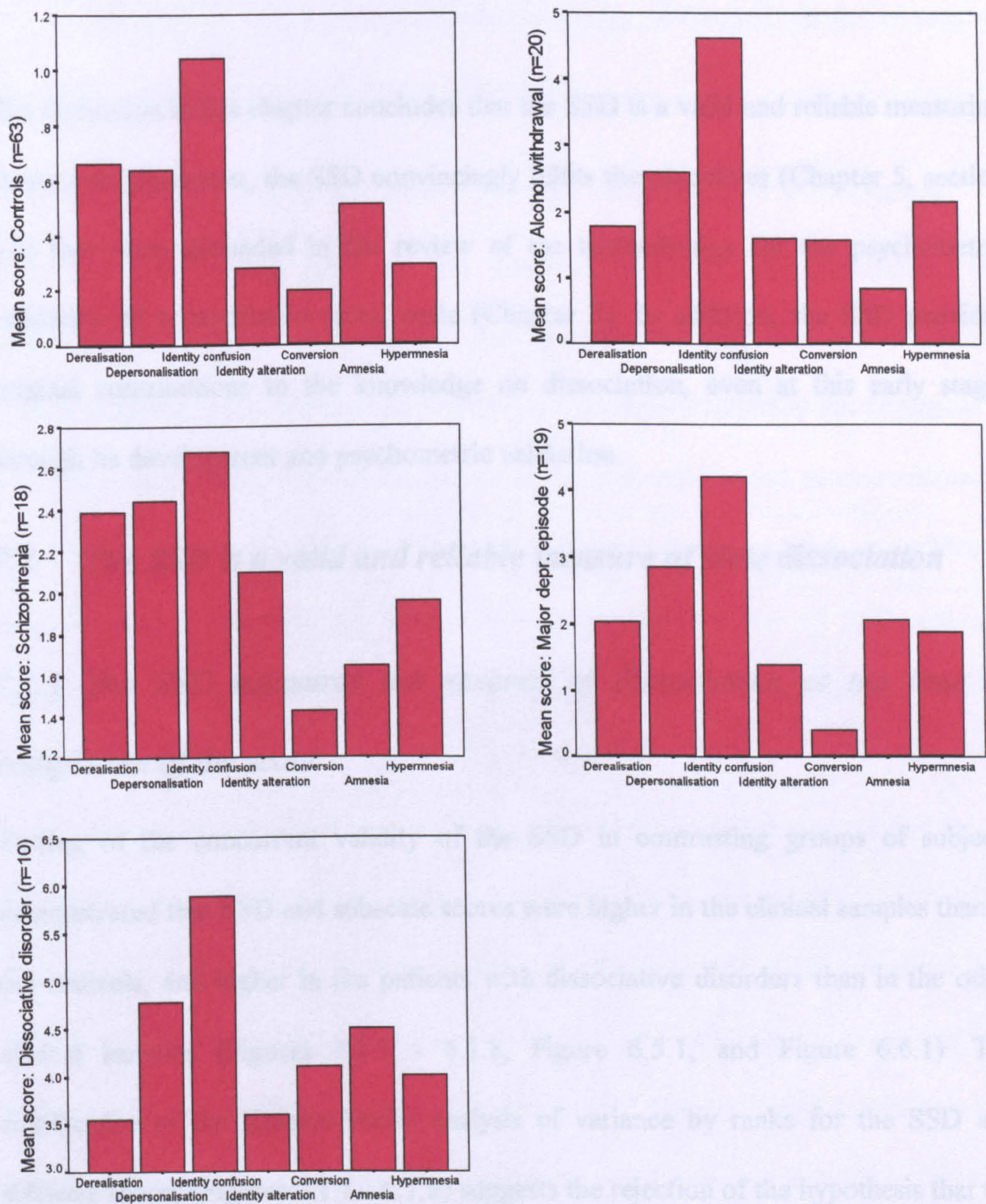
Paired-samples T-test to compare mean SSD scores:

Subgroup	95%CI-lower*	95%CI-upper*	t	df	Sig(2-tailed)
Whole population	0.41	0.71	7.26	129	<0.001
Patients	0.59	1.08	6.77	66	<0.001
Controls	0.12	0.42	3.56	62	0.001
Alcohol withdrawal	0.61	1.56	4.81	19	<0.001
Major depr. episode	0.25	0.84	3.85	18	0.001
Schizophrenia	0.22	1.22	3.02	17	0.008
Dissociative disorder	0.01	2.12	2.29	9	0.048

\* The 95% lower and upper confidence intervals in the table refer to the 95% confidence intervals of the difference between the means.



Figure 6.9 SSD subscale score profiles for each diagnostic group



\* Note that the scale on the Y axis differs for each diagnostic group.



## Psychometric validation of the SSD: Discussion

The discussion in this chapter concludes that the SSD is a valid and reliable measuring instrument. Moreover, the SSD convincingly fulfils the objectives (Chapter 5, section 5.2) that were grounded in the review of the methodology for the psychometric validation of a psychiatric rating scale (Chapter 3). In addition, the SSD provides original contributions to the knowledge on dissociation, even at this early stage, through its development and psychometric validation.

### ***7.1 The SSD is a valid and reliable measure of state dissociation***

#### ***7.1.1 The SSD measures the severity of dissociation at the time of completion of the scale***

Testing of the concurrent validity of the SSD in contrasting groups of subjects demonstrated that SSD and subscale scores were higher in the clinical samples than in the controls, and higher in the patients with dissociative disorders than in the other clinical samples (Figures 6.1.1 - 6.1.8, Figure 6.5.1, and Figure 6.6.1). The significance of the Kruskal-Wallis analysis of variance by ranks for the SSD and subscale scores (Figures 6.1.1 - 6.1.8) suggests the rejection of the hypothesis that the subgroup samples were drawn from the same distribution or from distributions with the same median, and provides statistical support for the visually obvious differences among the subgroups.



These findings concurred with the theoretical expectation that the patients with dissociative disorders would experience the highest intensity of dissociation and that the other clinical subjects would experience a higher intensity of dissociation than the control subjects, and demonstrated the sensitivity of the SSD to the severity of dissociation at the time of completion of the scale.

### *7.1.2 The SSD is sensitive to the temporal variability of dissociation*

The sensitivity of the SSD to the temporal variability of dissociation was demonstrated by graphic representation and by testing the difference between scores at two administrations of the SSD. Figure 6.8 illustrates graphically the difference in each diagnostic group between the scores at the first and second administrations of the SSD. A visual comparison of the differences can be interpreted as significant, because in each subgroup the difference between the two sets of SSD scores is comparable to or greater than  $1.96 \times$  standard error (i.e. the 95% confidence interval) of the first or the second SSD score (Aiken, 1996).

Moreover, the paired samples T-test of the differences between the two sets of SSD scores was highly significant ( $p < 0.01$ ) in all diagnostic groups, except in the patients with a dissociative disorder, where the difference was significant at the 0.05 level (and this relatively larger p-value may be due to the small sample of patients with a dissociative disorder). The highly significant paired samples T-test for the two sets of SSD scores shows that the SSD is sensitive to the change in dissociative state after the administration of four other psychiatric scales (the DES, BDI, BAI, and PANSS).

An objection might be that the design of administering the SSD before and after the other scales is not a sufficient precipitant for a change in SSD scores and that, therefore, the testing of its sensitivity to temporal variability is inadequate.

Nonetheless, despite this limitation, the difference between the scores on the first and second administrations of the SSD (Figure 6.8) was statistically highly significant.

Sensitivity to temporal variability was further demonstrated by the results from the pilot study. The low correlation between evening and morning SSD scores for the control sample also suggested that the SSD is sensitive to the temporal variability of dissociation (Chapter 5, section 5.3, Figure 5.5). Furthermore, the study of the EEG correlates in chapter 8 -10 will show sensitivity of the SSD to short-term changes in the severity of dissociation, as induced by experimental intervention.

### *7.1.3 The SSD compared to trait measures of dissociation*

#### **7.1.3.1 In some respects the SSD is similar to trait measures of dissociation**

The results of the psychometric validation of the SSD confirmed the convergent validity of the SSD with the DES (Figure 6.7.1). The convergent validity between the SSD (a state measure) and the DES (a trait measure) suggests that the two different scales measure aspects of the same phenomenon.

#### **7.1.3.2 In some respects the SSD is distinct from trait measures of dissociation**

The state and trait aspects of dissociation emerge during a consideration of the association between the SSD and the DES in the various subgroups. Some subgroups had trait and state features of dissociation, whereas others had predominantly state features. An example of the latter is found in the patients with alcohol withdrawal, where the SSD scores did not correlate significantly with the DES scores. On the other hand, both state and trait aspects featured among patients with schizophrenia, a major depressive episode, or a dissociative disorder, since the SSD and DES scores correlated highly significantly.



Results suggested that patients with alcohol withdrawal suffer predominantly from state dissociation. The results which suggested this are a lack of correlation between the SSD and the DES scores (Figure 6.7.1), the observed difference in SSD scores between the control subjects and the patients with alcohol withdrawal, and the smaller difference in DES scores, as observed in the confidence intervals (Figures 6.5.1 and 6.5.2).

The idea that the physiological insult of the withdrawal from alcohol may add to those patients' levels of state dissociation has not been addressed by previous studies. Dunn et al. (1993) reported a high prevalence of dissociative symptoms, as measured by the DES, in patients with enduring alcohol-related problems (including abuse and dependence). Other authors have differentiated between chronic and acute effects of alcohol (Wenzel et al., 1996). The latter authors found an association between the chronicity of alcohol-related problems and dissociative experiences (as measured by the DES), rather than acute (past month) dissociative effects of alcohol use. (Limitations of the latter study are discussed below in section 7.2.2.1.)

Figure 6.7.1 shows an interesting comparison between the magnitudes of the SSD score and the adjusted DES score across diagnostic groups. In control subjects and patients with dissociative disorders, the adjusted DES score exceeded the SSD score; whereas in patients with alcohol withdrawal, schizophrenia, or a major depressive episode, the SSD score exceeded the adjusted DES score. The latter finding suggests relatively more severe state dissociation than trait-like dissociative impairment; in other words, dissociative symptoms occur comorbidly in those three conditions, but do not reflect an underlying, premorbid tendency to dissociate.

In contrast, the DES scores of the control group (who suffer neither from a mental disorder, nor from dissociative state symptoms at the time of data collection)

reflect an ordinary tendency to dissociate sporadically. At the other extreme, the patients with a dissociative disorder have state- and trait-related problems. They suffer from dissociative states so frequently that the pattern of intermittent states becomes a pathological trait in itself. Their SSD scores were high at the time of data collection (i.e. they were experiencing dissociative state symptoms), and their even higher DES scores stressed the trait-like course of their illness. The trait predominance is a feature of this specific sample of patients with dissociative disorders, since they were all continuously impaired by their disorder, rather than episodically or transiently. Nevertheless, the SSD scores still reflect states that were superimposed on the trait features.

The different patterns of the SSD and DES scores in the above comparison do not point towards phenomenological differences between trait and state dissociation, or between so-called normal and pathological dissociation, let alone to an unjustified equation between trait dissociation and normal personality, or a similarly unjustified equation between state dissociation and psychopathology. Rather, the different patterns of the SSD and DES scores serve merely to highlight how transient dissociative states can be superimposed on a tendency (or a ‘non-tendency’) to those same dissociative experiences, during the course of psychiatric illnesses.

The pattern that was found during the comparison between SSD and DES scores is also mirrored in Figure 6.7.2, where PANSS composite indices are compared with SSD scores in the various diagnostic groups. This pattern is discussed under section 7.2.4.2 below (positive symptoms in patients with dissociative disorders).



### ***7.1.4 The SSD measures only dissociation***

#### **7.1.4.1 All the subscales of the SSD measure core dissociation**

The results of the internal factor analysis (principal components analysis with varimax rotation, Chapter 6, section 6.3.3.1), confirmed the construct validity of the SSD, and suggested that the SSD measures core dissociation. This is evidenced in very high loadings by many items on the first factor. This factor had an Eigen value of 23.762 and accounted for 42.4% of the variance in a five-factor solution that accounted for a total of 61% of the variance. The SSD subscales that contributed the most to the first factor were identity confusion, derealisation, and depersonalisation. However, the derealisation and depersonalisation items also loaded highly onto the other factors. These high loadings and the large size of the first factor suggest strongly that one general factor runs throughout the SSD.

The observation that all the SSD subscales contribute towards a single construct was also supported by separate factor analyses in the control patients and in the clinical subgroup. Moreover, factor analyses with oblique rotations also supported the finding of one general factor that runs throughout the SSD.

Figure 6.6.2 provides an additional illustration of the high correlations of each SSD subscale with the total SSD score, suggesting that all the subscales measure dissociation. The variability of correlation within the amnesia subscale may derive from the impairment of different aspects of memory in various diagnostic groups. The relatively lower correlation of the amnesia subscale score with the SSD score in the patients with alcohol withdrawal is discussed under section 7.2.2.2.2 below.

#### **7.1.4.1.1      *Conversion is not separable from the rest***

The conversion subscale of the SSD showed the highest factor loadings on internal principal components analysis with varimax rotation for the whole study population, and this might have suggested that conversion represented an independent factor. However, results of the principal components analyses with varimax rotation (Chapter 6, section 6.3.3.1) in the control sample and clinical sample again suggested (cf. section 7.1.4.1 above) that one general factor runs through the entire SSD. In the control sample, conversion clustered with amnesia, and in the clinical sample, conversion clustered with identity alteration. The results of the principal components analysis with oblique rotation (Chapter 6, section 6.3.3.1) for the whole study population also showed that conversion items clustered with identity alteration items, and the correlation coefficient of this factor with the other large factor was high (> 0.7).

The above results therefore confirm the construct validity of the whole SSD with its seven chosen symptom categories, and do not support the DSM-IV separation of conversion and other dissociative symptoms.

#### **7.1.4.1.2      *The identity confusion subscale is the most sensitive***

The identity confusion subscale yielded the highest scores of all the subscales. It might be the most sensitive of the subscales. Alternatively, its high scores for the patients with alcohol withdrawal and major depressive episodes, along with patients with dissociative disorders, might have suggested that it measures aspects of anxiety or depression, and not only dissociation, thus marring the otherwise good discriminant validity of the SSD. However, the internal consistency of the identity confusion subscale was high at 0.93 (Table 6.4) and comparable to that of the other subscales.



The interpretation that the identity confusion subscale is sensitive is therefore more plausible.

Also, the high scores on this subscale might suggest that identity confusion is the most prevalent of the dissociative symptoms covered in the SSD, or even that identity confusion represents one of the ordinary phenomena as contrasted with dissociative symptoms from a more pathological end of the spectrum.

**7.1.4.1.3      *The derealisation and depersonalisation subscales of the SSD are specific***

From a comparison of the derealisation and depersonalisation subscales between the SSD and the DES (figures 6.5.1 and 6.5.2), it appears that the depersonalisation/derealisation factor of the DES allows greater overlap between patients with schizophrenia and dissociative disorders, than the SSD subscales of derealisation and depersonalisation. In other words, the SSD subscales of derealisation and depersonalisation have greater discriminatory potential and appear more specific to dissociation.

**7.1.4.2 All the items of the SSD measure the same construct**

The reliability coefficients in Table 6.4 (for both internal consistency and split-half reliability) are considered very satisfactory. The Cronbach's alpha for the entire SSD of 0.97 compares favourably with those of the DES, the BDI, the BAI, and the PANSS, as summarised in the table below:

Scale		Cronbach's alpha	Reference
Dissociative Experiences Scale		0.96 - 0.97	Dubester et al. (1995)
Beck Depression Inventory		0.92	Beck et al. (1988)
Beck Anxiety Inventory		0.86	Beck & Steer (1993)
PANSS	Positive syndrome	0.73	Kay, Opler, Lindenmayer (1989)
	Negative syndrome	0.83	
	General psychopathology	0.79	
PANSS	Positive syndrome	0.62	Peralta & Cuesta (1994)
	Negative syndrome	0.92	
	General psychopathology	0.55	

Considering the internal consistency of the SSD subscales (Table 6.4), the lowest of the Cronbach's alpha coefficients, i.e. 0.82 for the amnesia subscale, is still satisfactory. Two factors may have contributed to that figure. First, the amnesia subscale with only 6 items is the smallest of all seven subscales, and this would affect the internal consistency as a large number of homogeneous items are more likely to yield a large alpha coefficient. However, 0.82 is still very good for such a small subscale. Second, the differential correlation in the various subgroups of the amnesia score with the total SSD score (Figure 6.6.2, discussed under section 7.2.2.2.2 below) may also have contributed to the relatively smaller internal consistency coefficient.



### ***7.1.5 SSD dissociation does not overlap with other constructs***

Testing of the discriminant validity of the SSD (Chapter 6, section 6.3.3.3) permits the conclusion that the SSD does not overlap with the concepts of depression, anxiety, or psychosis.

The clinical populations were chosen because of the prevalence of dissociative symptoms in these patients. On the whole, the study populations represented a comparative spectrum of a few of the most commonly diagnosed mental disorders. The sample of patients with dissociative disorders could be compared to these with regard to their scores on a few scales that are accepted measures of the constructs exemplified in the disorders, i.e. depression, anxiety, psychosis, and dissociation.

### ***7.1.6 The SSD is clinically useful to screen for dissociative disorders***

When the SSD *subscale profile* of the patients with a dissociative disorder is compared to that of the control group (see Figure 6.9 for the subscale profiles), the former is marked by a relative reduction in derealisation and a relative increase in conversion symptoms, in comparison with the control group. The relative increase in conversion symptoms is not a surprise in the light of the psychoanalytic, aetiological theory of ‘conversion / hysteria’, where an unconscious intrapsychic conflict is repressed and the resultant anxiety is converted into a somatic symptom (Kaplan et al., 1994).

Figure 6.6.1 demonstrates that the SSD scores of the patients with dissociative disorders were statistically significantly different from those of the subjects without a dissociative disorder (i.e. those with a different psychiatric disorder or the control subjects). From visual inspection of Figure 6.5.1, the subscales that discriminate the best between patients with and patients without a dissociative disorder are the

conversion and amnesia subscales, along with the total SSD score. However, an individual's symptom constellation may differ according to their specific dissociative disorder diagnosis; therefore further testing of the predictive validity was undertaken using the total SSD score only (Chapter 6, section 6.3.2.1.2) and Table 6.2).

As reported in Chapter 6 (section 6.3.2.1.2), the cut-off score of 3.9 for the SSD was chosen from the ROC curve in such a way that the sum of the sensitivity and specificity was maximal, so that some "false positive" predictions and some "false negative" predictions of a dissociative disorder were accepted, while the positive predictive value and negative predictive value were maximised.

The sample of patients with a dissociative disorder was relatively small compared to the rest of the subjects, and they were not all experiencing severe dissociative states during the data collection. As a result, their SSD scores were not all higher than the SSD scores of the subjects without a dissociative disorder, as suggested by the display of their 95% confidence intervals (Figure 6.6.1). In other words, some patients with a dissociative disorder had SSD scores  $< 3.9$  and some patients without a dissociative disorder had SSD scores  $\geq 3.9$ . Even if more patients with dissociative disorders were studied, the possibility that they might not dissociate at the time of the data collection would adversely affect the predictive validity of the SSD.

Furthermore, since the prevalence of the dissociative disorders is relatively low (here taken to be 5 - 10 %), and the post-test odds (for both of those values of prevalence) are greater than the relevant positive predictive value, an SSD score  $\geq 3.9$  would still mean the person is more likely not to suffer from a dissociative disorder than to suffer from a dissociative disorder.



Despite these limitations, the likelihood ratio of 10 (Table 6.2) indicates that the SSD is clinically useful for increasing the certainty of a diagnosis of a dissociative disorder. This value of 10 was relatively high compared to the likelihood ratio values obtained for other lower and higher cut-off scores. The post-test odds (Table 6.2) also demonstrate the 10 times higher certainty of a diagnosis of a dissociative disorder if the SSD score is  $\geq 3.9$ .

The high specificity (0.94) and the high negative predictive value (0.96 - 0.98) support the use of an SSD cut-off score of 3.9 for screening purposes, if it is to be used at all to identify patients with dissociative disorders. An SSD score of 3.9 or higher would need to be followed up by a detailed clinical interview or a diagnostic interview such as the DDIS or SCID-D, in the interest of accurate diagnosis of a dissociative disorder.

If the results of the testing of the predictive validity of the SSD are considered in the light of the comparison of the SSD to trait measures of dissociation (section 7.1.3), the SSD is anticipated to be most useful in the identification of people who are 'actively' or acutely dissociating, irrespective of the presence or absence of a psychiatric or other diagnosis.

The SSD measures the presence and intensity of dissociation at the time of completion of the scale, a property that will facilitate the study of concurrent neurophysiological correlates of dissociation, and a property that makes the SSD potentially useful in clinical situations, e.g., to supplement psychiatric assessment of a patient. However, it must be kept in mind that the SSD does not assess the longitudinal course of continuous or enduring symptoms of dissociation, and can therefore not be used as a diagnostic instrument.

Whereas section 7.1 was devoted to discussion of the characteristics of the SSD, which contribute to its validity and reliability, section 7.2 will look at the contribution of the SSD to the research on the phenomenon of dissociation.

## **7.2 *The SSD contributes to research on dissociation***

### **7.2.1 *Dissociative states may lie on a continuum of severity***

As will be discussed below, the results of the psychometric validation of the SSD suggest the presence of two continua of dissociation - a state continuum of the severity of dissociation, and a trait continuum of the frequency of dissociation.

In Figure 6.2, the non-significant Kolmogorov-Smirnov D-statistics for all the clinical subgroups and for the patient group as a whole mean the hypothesis that the SSD scores are normally distributed should not be rejected, leaving the possibility that the SSD scores are indeed normally distributed, or at least that the distribution of SSD scores is compatible with a normal distribution in each clinical sample and in the clinical population as a whole.

Despite the initial impression of a poor fit of a normal distribution to the SSD score of the control group and the study population as a whole, those results need to be evaluated in the light of the diverse study population. The contrast inherent in the choice of subgroups, and the relatively large sample size of the control group compared to each clinical group, would create an artificial bipolarity of scores in the study population as a whole. Nevertheless, the Kolmogorov-Smirnov test for the study population as a whole still allows the possibility that the SSD scores of the entire study population could be normally distributed, thus supporting the idea of a



continuum of dissociative experiences in the general population, from a milder or more 'normal' end to a more severe or 'pathological' end of the spectrum. 'Normal' as used here would refer to a low intensity of dissociative experiences and 'pathological' would refer to a high intensity of, or severe dissociative symptoms, at the time of completion of the SSD.

The idea of a continuum of *severity* of state-like dissociative experiences (as measured by the SSD) would complement the idea of a continuum of the usual frequency of dissociative experiences, or a dissociative trait (as measured by the DES). These two ideas address different aspects of the same phenomenon. On the basis of the results discussed above, these two ideas should not be taken to suggest that the DES (or trait-like aspects of dissociation) would represent the more normal end of the spectrum, whereas the SSD (or state-like aspects of dissociation) would represent the more pathological end of the spectrum. Rather, there are two continua - a state continuum and a trait continuum - where the former refers to the intensity of dissociative experiences, and the latter to the frequency of dissociative experiences. The two continua address different time or durational aspects of dissociation.

In summary, the distribution of SSD scores in the various samples supported the idea of two continua - a state continuum (from mild to severe dissociative experiences) and a trait continuum (from sporadic to frequent dissociative experiences). The state continuum addresses (cross-sectionally) the momentary or short-term variability in the intensity of dissociative experiences, whereas the trait continuum addresses (longitudinally) the variable course of dissociative experiences over time. The SSD is a measure of the state continuum of dissociation, whereas the DES is a measure of the trait continuum of dissociation. The SSD and the DES thus measure different time or durational aspects of the same phenomenon of dissociation.

### *7.2.2 SSD scores may be sensitive to concurrent psychoactive substance use and to withdrawal from such substances*

#### **7.2.2.1 Concurrent psychoactive substance use and asthma in control subjects**

As reported in Chapter 6, section 6.1 (fourth paragraph), the control subjects with exceptionally high DES scores appeared to be asthma sufferers who had used psychoactive substances in addition to their regular bronchodilators. The question arises whether the use of bronchodilators or recreational drugs may precipitate dissociative experiences. Bronchodilators are known causes of delirium (Kaplan & Sadock, 1995), but no case reports of specific dissociative side-effects of these medications have been identified. With regard to the effects of recent alcohol or other drug use (i.e. during the previous month), Wenzel et al. (1996) found no dissociative effects of recent use of alcohol or drugs in detoxified substance abusers, as measured by the DES. But the DES was not designed to assess dissociation during a time frame of a month, and since it is a trait measure, it was not likely to be sensitive to dissociative effects of recent alcohol or drug use. Furthermore, Wenzel et al. did not specify the length of time since detoxification, so that their past diagnosis of substance dependence might be considered irrelevant to recent or present dissociation since, for example, the dependence might have occurred, say ludicrously, 10 years previously. Thus, their study does not succeed in excluding the possibility of alcohol-induced dissociation. Melges et al. (1974) used the Depersonalisation Inventory to study experimentally the dissociative effects (in particular temporal disintegration) of alcohol and cannabis in normal volunteers, and found a pronounced dissociative effect from cannabis and a slightly lesser effect from alcohol.



Therefore, in the present study, there would still be reason to suspect that recreational drug use among the 5 outlying control subjects might have contributed to their high levels of dissociation. Another factor that might increase the level of dissociation of these outlying control subjects is their asthma. Apart from the possible contribution by the bronchodilators, a pattern of habitual hyperventilation might result in a higher frequency of dissociative experiences (Cohen, 1988).

#### **7.2.2.2 Dissociative symptoms in patients who suffer from alcohol withdrawal**

##### **7.2.2.2.1 *Dissociative symptoms during alcohol withdrawal***

The patients with alcohol withdrawal experienced more severe dissociative symptoms than the control subjects (Figure 6.5.1 and Figures 6.1.1 - 6.1.8). The question is whether the symptom profile of this subgroup is due to their intake of alcohol until 2 - 3 days previously, due to the withdrawal from alcohol, or due to the medication used in the detoxification regimen to alleviate their symptoms of withdrawal.

As discussed under section 7.2.2.1 above, acute alcohol intake may result in increased dissociation; however, this acute effect is unlikely to remain present after a few days of abstinence. The possibility of a dissociative effect from the medication used in the detoxification regimen is perhaps more likely. However, the withdrawal symptoms were most evident at the time of administering the SSD, and it is likely that the dissociative symptoms of these patients formed a part of their withdrawal syndrome.

Withdrawal from other substances has been reported to include dissociative symptoms. Prominent depersonalisation has been described in a 46-year-old woman with bipolar disorder after discontinuation of a daily dose of 2.5 mg of nitrazepam (Terao et al., 1992). Her depersonalisation started 9 days after the discontinuation of

the nitrazepam, lasted 10 days, and disappeared within 24 hours after the nitrazepam was reinstituted. It is possible that this SSD study demonstrates a similar effect, even though the DSM-IV criteria of alcohol withdrawal include no dissociative experiences, apart from isolated hallucinatory experiences.

Although the dissociative symptoms of the patients with alcohol withdrawal might have formed a part of their withdrawal syndrome, it is possible that the medication used in the detoxification regimen may also have played a part. The confounding role of a dissociative effect from the medication used in the detoxification regimen could only be excluded by repeating the study in patients with untreated alcohol withdrawal and in normal volunteers taking an alcohol withdrawal treatment regimen. However, the ethical implications of non-treatment of alcohol withdrawal, and the ethical implications of non-indicated withdrawal treatment, would not allow such a study.

#### **7.2.2.2.2      *Symptoms of amnesia during alcohol withdrawal***

From the SSD subscale score profiles in Figure 6.9, the patients with alcohol withdrawal appear to show a relative increase in hypermnesic symptoms and a relative reduction in amnesic symptoms compared to the control group (note that the labels on the Y-axis do not correspond to the same numerical range as those of the control group). Congruent with the latter, Figure 6.6.2 showed the relatively lower Pearson correlation coefficient for the association between the amnesia subscale score and the total SSD score in the patients with alcohol withdrawal. It is possible that the relative reduction in amnesic symptoms is responsible for the lower correlation coefficient in Figure 6.6.2.



#### **7.2.2.2.3      *Comorbid dissociative and anxiety symptoms during alcohol withdrawal***

The patients with alcohol withdrawal showed high levels of anxiety as shown by a high BAI score (Figure 6.5.4). This might be due to the fact that the BAI contains numerous physiological symptoms of anxiety; such physiological symptoms also forming a large part of the picture of alcohol withdrawal. However, the PANSS anxiety item (G2), which refers to worry and nervousness rather than to autonomic symptoms, was also scored highly in the patients with alcohol withdrawal, suggesting that the impression of high levels of anxiety symptoms in patients with alcohol withdrawal may be a true effect.

The question also arises whether only those alcohol withdrawal patients who experience prominent dissociative symptoms, also experience prominent anxiety symptoms, i.e. whether the dissociative and anxiety symptoms that occur during alcohol withdrawal are linked in any way, or occur only in a certain subgroup of patients with alcohol withdrawal. A study aimed at examining the comorbidity of dissociative and anxiety symptoms in patients with alcohol withdrawal might involve samples from different subgroups of patients with alcohol withdrawal and control subjects.

### **7.2.3      *Comorbidity between dissociative and depressive symptoms***

#### **7.2.3.1      *Dissociative symptoms in patients with a major depressive episode***

Figure 6.9 showed that the patients with a major depressive episode had an SSD subscale score profile comparable to that of the control group (taking into account the different scales on the Y-axes), except for a relative increase in hypermnestic symptoms and a relative reduction in conversion symptoms. This might reflect the

homogeneity of this specific sample, their relatively low level of comorbidity with other disorders such as the dissociative disorders, and the relative absence of somatising defence mechanisms among these patients.

However, patients with major depressive disorders are known to suffer from dissociative symptoms at times in addition to their affective symptoms (Kaplan & Sadock, 1995; APA, 1994). This may be reconciled with the findings of the present study by examining the relationship between dissociative and depressive symptoms in patients with a major depressive disorder from a variety of subject samples with different subtypes of depressive symptom constellations.

#### **7.2.3.2 Symptoms of depression in patients with dissociative disorders**

Figure 6.5.3 shows the high BDI scores in patients with dissociative disorders. These high levels of depression in patients with dissociative disorders are consistent with the literature (Ross et al., 1989; Ellason & Ross, 1995). Not only did this sample of patients with dissociative disorders have high BDI scores (figure 6.5.3), but they also showed high PANSS depression cluster scores (figure 6.5.6) - even higher than those of the patients with a major depressive episode. In addition to the high scores of the patients with dissociative disorders on measures of depression, their subjective experience of a low mood as one of the most important reasons why they were receiving treatment concurred with clinical observations that depressive comorbidity played a role in their admission to a psychiatric hospital or sustained treatment in the community.

Some of the dissociative disorders, in particular dissociative identity disorder, often prove difficult to diagnose (Kluft, 1987). In addition, the scepticism with which dissociative disorder diagnoses are regarded by some psychiatrists and general



practitioners may contribute towards delays in the diagnosis and treatment of patients with dissociative disorders, and the complication of these disorders by comorbid depressive disorders before those patients are appropriately diagnosed and treated. Patients with diagnoses of 'pure', uncomplicated dissociative disorders without comorbidity are not often found in the National Health Service. It is possible that the results of this study might have been different (less overlap between patients with dissociative disorders and a major depressive episode with regard to BDI score), had only patients with uncomplicated dissociative disorders, without comorbidity, been included.

#### *7.2.4 Distinguishing between dissociative symptoms and psychotic symptoms*

##### **7.2.4.1 Dissociative symptoms in patients with schizophrenia**

From Figure 6.9 the SSD subscale profile of the patients with schizophrenia appears flattened out compared to the control group. (Note that the scale on the Y-axis is different from that of the control group.) The patients with schizophrenia show a relative reduction in scores on the identity confusion, conversion, and amnesia subscales, or alternatively seen, a relative increase in derealisation, depersonalisation, identity alteration, and hypermnestic symptoms.

Identity alteration has traditionally been regarded as an almost pathognomonic symptom for dissociative identity disorder. It is surprising therefore that the patients with schizophrenia showed such a large range of identity alteration scores, which extends almost to the same severity as that of the patients with dissociative disorders (Figure 6.1.5).

The 95% confidence intervals in Figure 6.5.1 show much less overlap in identity alteration scores between patients with schizophrenia and dissociative disorders. Two possible interpretations follow: First, there is the possibility that one or more of the patients in the schizophrenia group may actually have been misdiagnosed and really suffer from a dissociative disorder (as is said to happen frequently - Ellason & Ross, 1995). Second, as demonstrated in Chapter 2, the identity alteration items in the SSD show a degree of potential overlap with delusions of being controlled, and the high scores on identity alteration by some of the patients with schizophrenia may actually reflect their delusions of that kind.

Of the 18 patients with schizophrenia, 5 had identity alteration scores  $> 3.9$  (the derived cut-off score beyond which there is a 5 - 7 times increased risk of having a diagnosis of a dissociative disorder (cf. Chapter 6, section 6.3.2.1.2). All 5 of these patients, like the other 13, fulfilled the DSM-IV criteria for schizophrenia. In 4 of these patients, the diagnosis of schizophrenia had always been beyond any clinical doubt and they presented no differential diagnostic problem. The 5th patient, who also had the highest identity alteration score of these 5 patients (a score of 6.75), had initially presented with a low mood, dissociative symptoms, and somatic symptoms. However, at the time of the assessment for this study, his mental state clearly showed prominent delusions and thought form disorder, in addition to prominent auditory hallucinations.

In the light of the above, the second interpretation, i.e. that the identity alteration items in the SSD show a degree of potential overlap with delusions of being controlled, and that the high scores on identity alteration by some of the patients with schizophrenia may actually reflect their delusions of that kind, appears more plausible.



#### **7.2.4.2 Positive psychotic symptoms in patients with dissociative disorders**

The patients with dissociative disorders in this study experienced psychotic symptoms, as measured by the PANSS. They experienced high levels of positive psychotic symptoms, high levels of general psychopathology, and some negative symptoms (Figure 6.5.5). Their high levels of psychotic symptoms overlapped with the levels obtained for the patients with schizophrenia.

Such overlap of positive psychotic symptoms between patients with dissociative disorders and schizophrenia has been reported numerous times; not necessarily, though, in the context of research studies or scale measures (Kluft, 1987; Fink & Golinkoff, 1990; Gainer, 1994). However the overlap, as found in this study, is congruent with similar studies in the literature. The interpretation of these studies is done by comparing the PANSS scores of 4 samples of patients: the ten patients with dissociative disorders from the present study; the patients with schizophrenia in this sample (n=18); the normative sample of 240 patients with schizophrenia in the study by Kay et al. (1987); and the 108 patients with dissociative identity disorder / DID in the study by Ellason & Ross (1995). This comparison is represented in Table 7.1. The patients with dissociative disorders in the present study experienced less severe positive symptoms than the patients with schizophrenia in the present study (see also Figure 6.5.5) or the 240 patients with schizophrenia in the normative sample by Kay et al. (1987). In contrast, the 108 patients with dissociative identity disorder (DID) in the study by Ellason & Ross (1995) experienced more severe positive symptoms than the patients with schizophrenia. The levels of general psychopathology in patients with dissociative disorders in the present study are similar to those quoted for the patients with DID (Ellason & Ross, 1995), but higher than the levels in any of the patients with schizophrenia (see also Figure 6.5.5). The level of negative symptoms in

patients with dissociative disorders in this study is lower than that of the patients with DID (Ellason & Ross, 1995). Both of these groups of 'dissociative' patients had lower levels of negative symptoms than either of the two groups with schizophrenia.

The findings in this study confirmed the previous observations of symptom overlap between patients with dissociative disorders and schizophrenia, especially for positive psychotic symptoms. However, the findings in the present study are less marked than those by Ellason & Ross (1995), perhaps because this sample represented a variety of dissociative disorders instead of only patients with DID as in their sample. Moreover, the sample of patients with dissociative disorders in the present study was small (n=10). The possibility should also be kept in mind that some of the patients with high positive syndrome scores (and high negative syndrome scores) in the sample of Ellason & Ross actually suffered from schizophrenia, but were misdiagnosed with DID.

Although the sample of patients with dissociative disorders in this study was small and had a variety of specific diagnoses, they had quite homogeneous PANSS positive syndrome scores. The one patient with a DSM-IV diagnosis of DID was the exception - she had a higher PANSS positive syndrome score (a score of 27). This score was even higher than the mean score of Ellason & Ross' (1995) sample of patients with DID (a mean score of 23.80). The patient with DID in this study showed dramatic and frequent alteration of identity, even during the data collection. Besides the severity and rapidly fluctuating nature of her dissociative experiences, her reality testing was intact and she had insight into her condition.

The above comparisons between the PANSS scores of the different patient groups clearly show the overlap between patients with schizophrenia and dissociative disorders in terms of positive psychotic symptoms. This study provides some support



for the conclusions by Ellason & Ross (1995) that the diagnostic criteria for schizophrenia should be weighted towards negative symptoms, that DID be incorporated as an exclusion criterion for schizophrenia, and that positive symptoms be included in the criteria for DID.

Although the patients with schizophrenia and dissociative disorders in this study shared positive (and negative) symptoms, they differed in their PANSS composite indices<sup>17</sup> (cf. Table 7.1). Figure 6.7.2 provides a visual comparison of SSD scores and PANSS composite indices in this study. The control subjects and the patients with dissociative disorders showed a positive PANSS composite index, whereas the patients with alcohol withdrawal, schizophrenia, or a major depressive episode showed a negative PANSS composite index. This pattern of PANSS composite indices among the diagnostic groups is reminiscent of the pattern reported under section 7.1.3.2 above and visualised in Figure 6.7.1.

This difference of PANSS composite indices between patients with schizophrenia and dissociative disorders is also found in the literature. The patients with schizophrenia in the normative sample of Kay et al. (1987) had a negative mean composite index, whereas the patients with dissociative disorders in the sample of Ellason & Ross (1995) had a positive mean composite index. These findings might suggest that patients with dissociative disorders suffer more from positive symptoms than from negative symptoms, whereas patients with schizophrenia suffer more from negative symptoms than from positive symptoms. Furthermore, these findings might suggest that negative symptoms are important in the distinction between schizophrenia and dissociative disorders.

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<sup>17</sup> The PANSS composite index equals the score of the PANSS positive syndrome minus the score of the PANSS negative syndrome.

The lower mean composite index score in this sample, as compared to the sample of Ellason & Ross, may be a result of comorbidity. The 2 patients with dissociative disorders in this sample, who also suffered from a severe comorbid depressive illness, had negative composite scores.

The relationship between dissociative symptoms and psychotic symptoms has not yet been elucidated. The merits of the idea of autohypnotic induction of positive symptoms by patients with dissociative identity disorder (Kluft, 1987), and of the idea of traumatic and dissociative underpinnings of psychotic symptoms (Allen et al., 1996) remain to be tested. But despite the fact that the patients with dissociative disorders and schizophrenia share symptoms, and despite untested hypotheses about the link between these symptoms, the constructs of dissociation and ‘psychosis’ are distinct from one another, as evidenced by the external factor analysis where the SSD items and the PANSS items clustered into separate uncorrelated factors (Chapter 6, section 6.3.3.3).

### ***7.3 Methodological limitations of the psychometric validation of the SSD***

This study has identified some limitations in the methodology of psychometric testing of a psychiatric rating scale, as relevant to the SSD.

#### ***7.3.1 Testing the predictive validity of the SSD***

As discussed under section 7.1.6, the main limitation of the SSD is that its clinical usefulness is limited to an immediate assessment of dissociative symptomatology and, at most, to screening for the presence of a dissociative disorder. The SSD does not



address the longitudinal course of dissociative symptoms over time, and therefore the SSD cannot be used in the diagnosis of dissociative disorders.

The question might be asked why the predictive validity of the SSD was examined in the first place, if the SSD was never intended to be a diagnostic instrument. It was examined as a part of the usual thorough psychometric validation of a psychiatric rating scale (as discussed in Chapter 3). The examination of the predictive value of the SSD turned out to be a valuable part of the psychometric validation of the SSD, since the lack of predictive validity emphasised that the SSD occupies specifically the *state* niche among the other measures of dissociation, and thereby implied that the SSD is a good *state* scale of dissociation.

### *7.3.2 Testing the convergent validity of the SSD*

The method of testing the convergent validity depends on the association between scores of the new scale and scores of another, known and proven scale that measures the same phenomenon. In this study the DES, a well-known, valid, and reliable measure of dissociation, was used for the testing of the convergent validity of the SSD. However, as discussed in the previous paragraph, the DES is an example of a measure of the trait continuum of dissociation, whereas the SSD is an example of a measure of the state continuum of dissociation. The use of the DES (which measures one aspect of dissociation), as a standard against which to compare the SSD (which measures a different aspect of the phenomenon of dissociation), was not ideal, yet inevitable considering the lack of another state measure of dissociation.

### *7.3.3 Testing the discriminant validity of the SSD*

The ‘external’ factor analysis (Chapter 3, section 3.3.3.3), the method by which the discriminant validity of the SSD (in comparison with the BDI, the BAI, and the

PANSS) was tested, presented another methodological limitation in the psychometric testing. . The method of external factor analysis may distinguish among different constructs (as represented by different scales), but does not take into account possible comorbidity of the different symptoms in certain clinical populations. In other words, if a patient suffered from more than one disorder, then the discriminant validity might be compromised, since the external factor analysis might show high correlations between the items of two different scales. This potential problem might be overcome by using a two-way analysis of variance, or a method of multiple regression (Altman, 1991).

#### *7.3.4 Testing the sensitivity of the SSD to the temporal variability of dissociation*

The limitations of the methods used for the testing of the sensitivity of the SSD to the temporal variability of dissociation have been covered elsewhere (Chapter 3, section 3.5; Chapter 5, sections 5.2.7; 5.3.3.3; 5.3.4.4.6; 5.3.6.4; 5.4.3; and 5.5.4.6; and section 7.1.2 in this chapter). Future studies might also analyse the principal components at the baseline and on the next occasion (for example, after experimental induction of dissociation), comparing the factor structure at both points (Salvador-Carulla, 1996).

### *7.4 Conclusions about the psychometric validation of the SSD*

In summary, the SSD was demonstrated as a valid and reliable measure of the severity of dissociation experienced at the time of completion of the scale. First, it is valid. It measures what it is supposed to measure by virtue of its derivation from existing measures of dissociation (its content validity); its ability to distinguish between people



who dissociate and people who do not dissociate (its concurrent validity); the high correlations between its item scores and subscale scores with the total SSD score (its internal criterion-related validity); its construct validity on factor analysis where all the subscales were demonstrated to measure core dissociation; its satisfactory correlation with the DES (its convergent validity); and its lack of overlap with other constructs (its discriminant validity) when compared to the BDI, BAI, and PANSS). Second, it is reliable. It is relatively free from measurement errors by virtue of its high internal consistency and its high split-half reliability. Third, the SSD is what it was designed to be - a state scale of dissociation - by virtue of its sensitivity to the temporal variability of dissociation.

All of these psychometric properties result from meeting the objectives (Chapter 5, section 5.2) grounded in the review (Chapter 3) of methods to develop and test a psychiatric rating scale. Meeting the objectives would assure a reliable and valid scale. The SSD thoroughly fulfilled these objectives and thereby assured its validity and reliability as a state scale of dissociation.

Furthermore, the psychometric testing of the SSD has led to original contributions to research on dissociation. The first of these contributions is the observation of a state continuum and a trait continuum of dissociation. Another original contribution is that the psychometric testing of the SSD confirmed the comorbidity between dissociative and depressive symptoms in patients with a dissociative disorder and a major depressive disorder respectively. Also, the psychometric testing of the SSD demonstrated an overlap of symptoms between patients with a dissociative disorder and patients with schizophrenia, despite other symptomatological evidence in this study in favour of distinct diagnostic groups. The

results also suggested that SSD scores may be sensitive to concurrent psychoactive substance use or withdrawal from such substances.

The measurement of concurrent symptomatology in the various diagnostic groups was necessary to arrive at these contributions to research on dissociation. Moreover, a state measure of dissociation was a prerequisite for the concurrent measurement of dissociative states and other psychiatric symptoms, and thus allowed for the contributions on dissociation.

Pending further testing of the sensitivity of the SSD to experimentally induced, short-term changes in dissociative status (Chapter 8, section 8.3 - the pilot study), the SSD is suitable for application to study concurrent neurophysiological correlates of dissociation (Chapters 8 - 10).



**Table 7.1** A comparison of PANSS scores between patients with dissociative disorders and patients with schizophrenia

<i>Study</i>	<i>Diagnosis</i>	<i>N</i>	<i>Positive syndrome scale score</i>	<i>Negative syndrome scale score</i>	<i>Composite index</i>	<i>General psychopathology score</i>
Kay et al. (1987)	Schizophrenia	240	19.86 ± 6.27	21.75 ± 6.21	-1.89 ± 7.74	39.68 ± 9.48
This study	Schizophrenia	18	17.50 ± 6.16	19.72 ± 7.83	-2.22 ± 7.56	39.89 ± 14.52
This study	Dissociative disorder	10	15.10 ± 4.63	12.50 ± 5.62	2.60 ± 8.58	49.20 ± 7.41
Ellason & Ross (1995)	Dissociative identity disorder	108	23.80 ± 4.85	17.06 ± 4.03	7.23 ± 7.28	50.09 ± 7.71

# ***Part III - Concurrent electro-encephalographic correlates***

## **8**

### **EEG correlates: Pilot study, design and methods**

This chapter recounts the design and methods for the study of the concurrent electro-encephalographic (EEG) correlates of dissociation. A pilot study was performed in the interest of initial assessment of the sensitivity of the SSD to experimentally induced dissociative experiences, and in order to highlight methodological problems that might influence decisions about the design of the full examination of the EEG correlates.

As was also justified in Chapter 5 (which covered the pilot study, design, and methods of the psychometric validation of the SSD), the pilot study to the EEG correlates formed an integral part of the design and methods for the EEG correlates, and therefore the pilot study is presented in the same chapter as the rest of the design and methods. Because of the similarities between several of the topics in the design and methods of the psychometric validation, and those in the pilot study (which also has design and methods sections), and in order to minimise confusion between the different levels of topics, the headings in this chapter are detailed and indicate whether the material under them concerns the pilot study or the full design and methods for the EEG correlates. The text relating to the pilot study are also presented in a different font, so that they can be distinguished easily from the main body of this chapter,



which concerns the design and methods for the study of concurrent electro-encephalographic (EEG) correlates of dissociation.

The main headings of this chapter will, therefore, be the following (in the same order): aim of EEG correlates (section 8.1), objectives of EEG correlates (section 8.2), pilot study to EEG correlates (section 8.3), design of EEG correlates (section 8.4), methods for EEG correlates (section 8.5), and anticipated results of EEG correlates (section 8.6). The results of the EEG correlates will be presented in Chapter 9, and a discussion of the EEG correlates in Chapter 10.

### ***8.1 Aims of EEG correlates***

The two main aims of this study of the concurrent electro-encephalographic (EEG) correlates of dissociation were to assess the sensitivity of the SSD to experimentally induced temporal variability of dissociation, and to examine the relationship between dissociative experiences and EEG activity.

### ***8.2 Objectives for EEG correlates***

To meet the above aims, the objectives of the psychometric testing were formulated as follows:

#### ***8.2.1 Is the SSD sensitive to experimentally induced temporal variability of dissociation?***

The first question would be whether dissociative experiences can be induced experimentally, as suggested in Chapter 7, section 7.2.2. Assuming the SSD can measure the severity of dissociative experiences at the time of each experimental induction, as suggested by the results of the psychometric validation of the SSD (cf.

Chapter 7, section 7.1.1), the next question would be whether the SSD is sensitive to the temporal variability of the experimentally induced dissociative experiences.

### *8.2.2 What is the relationship (if any) between dissociative experiences and concurrent EEG activity?*

In particular, the following hypotheses would be tested:

1. Dissociation correlates with background theta EEG activity, as suggested by Spiegel & Vermuten (1994), Ray et al. (1994), and Sabourin et al. (1990).
2. Dissociation correlates with epileptiform EEG activity, as suggested by Schulz et al. (1995) and Coons et al. (1988).
3. Dissociation correlates with background beta EEG activity, as suggested by Sabourin et al. (1990).
4. Identity alteration correlates with frontal background delta EEG activity, as suggested by Cocker et al. (1994).

### *8.2.3 Do concurrent EEG correlates confirm the symptomatological clustering of dissociative symptoms?*

An examination of the relationship between each subscale of the SSD and the EEG correlates might show that the SSD subscales do not all share the same EEG correlates. For example, the issue whether conversion symptoms are separable from the other dissociative symptoms (cf. Chapter 7, section 7.1.4.1.1), or the issue whether depersonalisation belongs in the realm of dissociation (cf. Chapter 1, section 1.2.4), might be elucidated then.



#### *8.2.4 Do concurrent EEG correlates have implications for the relationship between state and trait dissociation?*

If a trait measure of dissociation, such as the DES, were also administered during this study of the EEG correlates of dissociation, the relationship between the subjects' SSD scores and their DES scores could be examined.

### *8.3 Pilot study to EEG correlates*

Following on the psychometric validation of the SSD, and in particular on the sensitivity of the SSD to temporal variability in the intensity of dissociation, this pilot to the study of EEG correlates was conducted with the participation of a single subject. In the interest of a uniform style of presentation for the thesis, the subject's results are presented in the form of a mini-study, even though they do not contain the same kind of information as a proper study, such as sampling details and statistical analyses.

#### *8.3.1 Pilot study: Aim*

This pilot represented a feasibility study about the sensitivity of the SSD to experimentally induced changes in the severity of dissociative experiences, and about the application of the SSD to study EEG correlates of dissociation.

#### *8.3.2 Pilot study: Objectives*

##### **8.3.2.1 Initial assessment of the sensitivity of the SSD to experimentally induced dissociative experiences**

Where the psychometric validation of the SSD showed that the SSD is sensitive to temporal variation of states, its sensitivity to experimentally induced states would be assessed in the pilot study.

### **8.3.2.2 Ironing out methodological problems for EEG correlates**

Possible methodological difficulties that were encountered in this pilot study would influence decisions about the design of the full examination of the EEG correlates.

### **8.3.3 *Pilot study: Design***

#### **8.3.3.1 Induce dissociative experiences experimentally**

Although most other studies of dissociative experiences have relied on retrospective reports of such experiences, mostly after naturally occurring traumatic events, Miller et al. (1994) reported on the experimental induction of depersonalisation and derealisation in patients with panic disorder and non-anxious control subjects. These authors used three methods to induce the symptoms: staring at a dot on the wall, staring in a mirror, and silent repetition of one's name. The results showed all subjects experienced significantly increased levels of depersonalisation and derealisation after the mirror and dot staring tasks, with the greatest effect resulting from staring in a mirror.

At the time of the pilot study, a mirror was not available and therefore, the method of staring at a dot on the wall was used here as a method to induce dissociation. In addition, the two stimulatory techniques commonly applied during EEG recording (photostimulation and hyperventilation) were also used here.

#### **8.3.3.2 Assess changes in SSD and subscale scores after each experiment**

The SSD would be administered after each experiment, and the change in SSD score and subscale scores assessed.

### **8.3.4 *Pilot study: Methods***

#### **8.3.4.1 Subject**

The subject was a 21 year old male inpatient at St. Michael's Hospital, Warwick, with a diagnosis of DSM-IV depersonalisation disorder, and a psychiatric history of 8 years duration. His medications included paroxetine and flupenthixol. Computerised tomography and magnetic resonance imaging of the brain had been performed; neither had



demonstrated any intracranial pathology. One previous EEG had demonstrated features suggesting the possibility of a left temporal epileptic focus, but follow-up EEGs were completely normal. Neuropsychological assessment had indicated a slight impairment of his visual memory, which might suggest an "organic deficit". The subject provided written informed consent for his participation in this pilot study.

#### **8.3.4.2 Instruments**

In addition to the SSD during the baseline condition and after each experimental induction, the DES, the BDI, the BAI, and the PANSS were administered during the baseline condition in order to facilitate interpretation of the results.

#### **8.3.4.3 Procedure**

The SSD was administered and demographic data obtained during the baseline condition. Subsequently the DES, BDI, BAI, and SCI-PANSS were administered, and then the SSD again. Three experimental conditions then followed: 1. Photostimulation at a frequency of 4 Hz during  $6 \times 10$  seconds; 2. Staring at a dot on the wall about 3 feet away and at eye level; and 3. Hyperventilation at a rate of about once every 2 seconds, blowing out all the air in his lungs, with eyes closed, for 3 minutes. (Possible side-effects were explained; he would stop hyperventilating if these were too uncomfortable.) After each experimental condition he completed a new copy of the SSD, and after each completion of the SSD his mental state was monitored and "grounded" (i.e. awareness of his immediate surroundings and awareness of his immediate experiences and emotions were encouraged), before continuing with the next experimental condition. The total study comprised 5 administrations of the SSD.

#### **8.3.4.4 Analysis**

The analysis consisted of a visual comparison of the SSD and subscale scores over the 5 conditions: baseline, "post-scales" (i.e., after the administration of the DES, BDI, BAI, and SCI-PANSS), photostimulation, dot-staring, and hyperventilation.

### ***8.3.5 Pilot study: Results***

#### **8.3.5.1 SSD variables**

Figure 8.1 represents the changing SSD and subscale scores over the 5 conditions for the subject of the pilot study. The scales on the axes of all the mini-graphs are identical to aid visual comparison.

#### **8.3.5.2 Other scales**

\* DES: Total DES score was 33. Absorption / imaginative involvement score was 23. Amnestic dissociation score was 29. Depersonalisation / derealisation score was 45.

\* BDI score was 23.

\* BAI score was 37.

\* PANSS: Total PANSS score was 69. Positive syndrome score was 11. Negative syndrome score was 21. Composite index score was -10. General psychopathology score was 37. Anergia score was 10. Thought disturbance score was 9. Activation score was 11. Paranoid / belligerence score was 3. Depression score was 11.

### ***8.3.6 Pilot study: Discussion***

#### **8.3.6.1 The SSD is sensitive to experimental induction of dissociation**

The largest changes in subscale scores were evident for his symptoms of derealisation, depersonalisation, and conversion. Similar, but slightly smaller changes were evident for his other symptoms (identity confusion and alteration, amnesia, and hypermnesia). His general response was to dissociate less after the administration of the other four scales (as was the case for the subjects who participated during the psychometric validation of the SSD). Photostimulation and staring at a dot tended to increase his levels of dissociation to around baseline levels again, and hyperventilation resulted in a sharp increase in derealisation, depersonalisation, and conversion symptoms.

Despite the limitations inherent in a study of one patient, these results serve as preliminary evidence for the sensitivity of the SSD to experimental induction of dissociation.



### **8.3.6.2 The subject's constellation of symptoms was reasonably typical**

This subject's scores at the different administrations of the SSD and on the other four scales were compared to the findings from the psychometric validation of the SSD. The comparison showed that his constellation of symptoms was reasonably typical of someone with a dissociative disorder, bearing in mind that his specific diagnosis of depersonalisation disorder would skew his SSD subscale profile towards depersonalisation and derealisation symptoms.

This subject's scores on all the scales administered were compared to the 95% confidence intervals of scale scores for each diagnostic subgroup presented in Chapter 6 (Figures 6.5.1 - 6.5.6). It appeared that the SSD and subscale scores of this subject (Figure 8.1) fell mostly within the 95% confidence intervals for the patients with dissociative disorders (Figure 6.5.1). His scores for derealisation, depersonalisation, conversion, and amnesia fell well within the confidence intervals for the patients with dissociative disorders. His scores for identity confusion, identity alteration, and hypermnesia corresponded less closely to the confidence intervals for the patients with dissociative disorders.

His DES score of 33 was above the cut-off score beyond which the presence of a dissociative disorder is usually considered seriously. His DES and subscale scores also distinguished depersonalisation / derealisation as his main symptoms. This subject's BDI score and PANSS depression score were lower than would be expected from the results of the psychometric validation of the SSD, but his BAI score fell within the 95% confidence interval for patients with dissociative disorders. Also, his PANSS negative syndrome score, composite index score, and anergia score indicated a more "negative" syndrome than expected.

### **8.3.6.3 Conclusions and implications for the methodology of the EEG correlates**

This demonstration of the sensitivity of the SSD to measure experimentally induced changes in dissociative states in a patient with a specific kind of dissociation supports the use of the SSD in the study of concurrent EEG correlates of baseline and experimentally induced dissociation. The main methodological problem in this pilot study was the subject's light sensitivity. Such light sensitivity might interfere with EEG recording in the later study of

EEG correlates. In order to prevent such difficulties, an opaque screen would be placed in front of the stroboscope (cf. section 8.4.4.4 below).

#### **8.4    *Design of EEG correlates***

After the initial testing of the sensitivity of the SSD to experimentally induced dissociation, and the examination for methodological problems (cf. section 8.3 above), the rest of the study of the concurrent EEG correlates could be designed, guided by the objectives formulated in section 8.2. A sample would be selected from a patient population with a high prevalence of dissociative symptoms. Dissociative experiences would be induced experimentally, and the SSD would be administered concurrently with EEG recording after each experiment. Spectral analysis of digital EEG signals would be followed by a study of the relationship between SSD variables and EEG variables.

Figure 8.2 outlines the design for analysis of the EEG correlates of dissociation. Note that three kinds of data are involved and these are represented by the three dimensions of the grid-like object in Figure 8.2: SSD variables, EEG variables, and experimental condition. The SSD and subscale scores are represented on the hypothetical X-axis on the 'grid' (8 variables). EEG waveband power is represented on the hypothetical Y-axis on the 'grid', and are further qualified by the specific waveband concerned and by the EEG electrodes that were used. EEG waveband power thus concerned 36 variables corresponding to 4 wavebands and 9 electrodes. The experimental conditions are represented on the hypothetical Z-axis on the 'grid', and correspond to the baseline condition and 4 experimental conditions (5 variables).



The large numbers in Figure 8.2 indicate roughly the temporal sequence that was followed in the design of the study of EEG correlates. After an initial analysis of the SSD results and the EEG results (separately), and their respective changes over the 5 experimental conditions, the next step was to assess the SSD-EEG correlations during each of the 5 experimental conditions. The canonical correlations between the set of SSD variables and the set of EEG variables were subsequently assessed. Finally, the SSD results and the DES results were interpreted together. The design is presented in more detail below:

#### *8.4.1 Assess the change of each SSD variable over 5 experimental conditions*

The distributions of the SSD and subscale scores were assessed. Comparisons were made among the scores of the SSD subscales, and also among the SSD scores of subgroups of the study population. The change of each of the 8 SSD variables over the 5 experimental conditions was then assessed. An assessment of the change would serve as a test of the sensitivity of the SSD to experimentally induced temporal variability of dissociation, and the suitability of the SSD to study concurrent EEG correlates of dissociation (and would meet the first objective under sections 8.2.1 above).

#### *8.4.2 Assess the change of each EEG variable over 5 experimental conditions*

The distributions of EEG waveband power were assessed. Comparisons were made among the power of the 4 wavebands, and also among the EEG power of subgroups of the study population. The change of each EEG variable over the 5 experimental

conditions was subsequently assessed. In addition, brain maps displaying the change in the EEG variables over the 5 conditions were inspected. As discussed above in section 8.4.1, this assessment would support the suitability of the SSD to study concurrent EEG correlates of dissociation.

#### *8.4.3 For each experimental condition: assess correlation between SSD and EEG variables*

In the interest of an initial assessment of the relationship between SSD variables and EEG variables, the association between SSD and EEG variables was assessed at each experimental condition. The most significant correlations were summarised.

#### *8.4.4 Assess the correlations between the set of SSD variables and the set of EEG variables*

Canonical analyses were used to assess the correlations between the set of SSD variables and the set of EEG variables. Patterns of significant canonical correlations were assessed first at the vertex electrode, and subsequently at the other electrodes. In order to facilitate their interpretation, the significant SSD-EEG relationships were then illustrated by additional, selected scatterplot matrices and by selected brain maps.

These analyses would contribute to the meeting of the second objective (section 8.2.2 above), i.e. the assessment of the relationship between dissociative experiences and concurrent EEG activity. In particular, the relationships between certain dissociative experiences and certain kinds of EEG activity could be studied. Subsequently, the implications of the canonical analyses for the symptomatological clustering of dissociative experiences would be studied (third objective, section 8.2.3).



#### ***8.4.5 Assess the relationship between SSD data and DES data***

An assessment of the relationship between the SSD data and the DES data might meet the fourth objective (section 8.2.4), and illuminate the relationship between state and trait dissociation.

### ***8.5 Methods of EEG correlates***

#### ***8.5.1 Subjects for EEG correlates***

After demonstrating the sensitivity of the SSD to experimental induction of dissociative experiences, the rest of this initial study of the EEG correlates of dissociation was designed for implementation with the participation of a sample of patients with complex partial seizures. The choice of such a sample was influenced by numerous reports of dissociative symptoms in these patients (Lishman, 1987; Bancaud & Talairach, 1992; Broglin et al., 1992; Wieser et al., 1992; Luciano, 1993; Schenk & Bear, 1981). Patients with complex partial seizures would thus represent a population where dissociative experiences, as well as EEG changes, would be expected - this combination provided a suitable environment for an initial study of concurrent EEG correlates of dissociation.

##### ***8.5.1.1 Study population for EEG correlates***

The subjects were all patients at the Institute of Psychiatry / Maudsley Hospital, with complex partial epilepsy, who had undergone investigation with a view to possible surgery for their intractable epilepsy. Some of them had undergone surgery, others were waiting for surgery, and in others surgery had been contra-indicated. The patients were initially approached telephonically, after which an information sheet and

a formal invitation to participate in the study were posted to them. An appointment was arranged for their attendance at the Institute of Psychiatry.

#### **8.5.1.2 Inclusion criteria for the sample**

- a) All patients had complex partial epilepsy.
- b) Clinical evidence of seizures had been augmented by using three special investigations: EEG, video telemetry, and brain CT or MRI.
- c) Patients who had already undergone surgery for their epilepsy were included alongside those who were waiting for surgery or were not to undergo surgery.

#### **8.5.1.3 Exclusion criteria for the sample**

- a) Patients who suffered from significant comorbid psychiatric illness or substance-related problems were excluded.
- b) Patients with acute medical problems requiring treatment were excluded. For example, one subject was excluded due to having had a seizure 2 days previously and having received sutures to his scalp after the resultant head injury. In addition to the possible discomfort from participation, it was thought that the recent seizure and the scalp sutures might result in spuriously high levels of slow wave activity on the EEG.

#### **8.5.1.4 Ethical considerations for EEG correlates**

- a) As indicated in Chapter 5, the protocol for the entire research project (psychometric validation as well as the study of concurrent EEG correlates) was submitted to and approval was obtained from 4 research ethics committees. The approval relevant to this study of the EEG correlates at the Institute of Psychiatry, was the approval by the Maudsley Hospital Research Ethics Committee.



- b) An information sheet was provided to all subjects and informed consent was obtained from all subjects (Appendix 4).
- c) The patients were only included where their participation in the study was not clinically contra-indicated, e.g., where their clinical condition and mental state were such that their participation was not anticipated to result in significant distress to the patient. As reported under section 8.5.1.3 above, one patient was excluded due to a seizure 2 days previously and sutures to his scalp after the subsequent head injury.
- d) The subjects were reimbursed for their travel expenses to the Institute of Psychiatry.
- e) If the patient preferred, the contents of their scale responses were assessed on site and discussed with them.

### ***8.5.2 Experimental induction of dissociation***

In this study dissociative experiences were induced in 4 ways:

#### **8.5.2.1 Staring into a mirror**

As reported under section 8.3.3.1 above, the study by Miller et al. (1994) contrasted with previous retrospective studies of naturally occurring traumatic dissociation, by their use of experimental procedures to induce depersonalisation and derealisation. Those authors used three methods to induce the symptoms: staring at a dot on the wall, staring in a mirror, and silent repetition of one's name. The results showed that all subjects experienced significantly increased levels of depersonalisation and derealisation after the mirror and dot staring tasks, with the greatest effect resulting from staring in a mirror.

Although Miller et al. (1994), found staring into a mirror to be an effective method to induce depersonalisation and derealisation experiences, they did not assess

the ability of that exercise to induce any other dissociative experiences. Nevertheless, the supposedly increased awareness of one's own identity on confrontation with one's mirror image was considered to have the potential to induce symptoms of identity confusion and identity alteration in people with a vulnerability to those symptoms.

#### **8.5.2.2 Photostimulation at 4 Hz**

Historical reports of links between dissociative symptoms and epilepsy (cf. Chapter 1, section 1.2) motivated the use of the procedures, which are known to precipitate the emergence of epileptiform EEG activity. The frequency of 4 Hz was chosen on the grounds of possible recruitment of delta or theta frequencies (see objectives above).

#### **8.5.2.3 Photostimulation at 14 Hz**

The frequency of 14 Hz was chosen on the grounds of possible recruitment of alpha or beta frequencies (see objectives above).

#### **8.5.2.4 Hyperventilation**

Hyperventilation was chosen because it is known to result in increased slow wave activity, and also because the symptom of depersonalisation has been said to occur only in the context of over-breathing, regardless of the psychiatric diagnosis (Cohen, 1988).

### **8.5.3 *Instruments used for EEG correlates***

Rating scales and electronic equipment were used, viz. the SSD, the DES, questions on demographic information, and EEG recording and analysing equipment.



#### **8.5.3.1 SSD**

The State Scale of Dissociation (SSD), a 56-item, self-report measure of the intensity of dissociative experiences at the time of completion of the scale, which had been psychometrically validated (Chapters 4 - 7), was used here to measure the intensity of dissociation before and after the experimental induction of dissociation.

#### **8.5.3.2 DES**

The Dissociative Experiences Scale (DES - Bernstein & Putnam, 1986), a 28-item, self-report measure of the usual frequency of dissociative experiences, was used here in the baseline condition, to test the claims of a higher-than-normal frequency of dissociative experiences in this study population.

#### **8.5.3.3 Demographic information - questions**

The following demographic information was collected on what was called the “front sheet” of the data collection pack: age, gender, localisation of the epileptic focus, history of brain damage or brain surgery, psychiatric history, regular medications, and results of relevant special investigations such as EEG, brain computerised tomography (CT), and magnetic resonance imaging (MRI).

#### **8.5.3.4 EEG equipment**

##### **8.5.3.4.1        *Electrodes***

EEG electrodes were placed according to the international 10/20 system. Nine channels were used in the analysis of the data (vertex / cz, left and right frontal / f3 and f4, left and right parietal / p3 and p4, left and right mid-temporal / t3 and t4, and left and right occipital electrodes / o1 and o2). Mandibular electrodes were used as reference electrodes.

#### 8.5.3.4.2 *Experimental conditions*

The experimental conditions, such as environment and time of the day, were kept constant for all subjects.

#### 8.5.3.4.3 *Recording instruments*

A *Ceegraph* SE digital EEG system, model 804, version 5.51 (Bio-Logic Systems Corp., 1992-1996), *Brain Atlas* software (model 173, version 2.35, Bio-Logic Systems Corp., 1992) and *Brain Atlas Reader* software (model 594, version 2.52, Bio-Logic Systems Corp., 1993) were used in the recording and analysis of the EEG data.

#### 8.5.3.4.4 *Stroboscope details*

The stroboscope was a Strobosun Type 1203 C by Dawe Instruments Ltd. It was calibrated for two settings, 4 Hz and 14 Hz, and the calibration checked by photosensitive diodes. The light was positioned 150 cm in front of the subject's eyes, at eye level. The stroboscope was switched on and off manually during the experiments.

As directed by the results of the pilot study (section 8.3.6.3 above), an opaque screen, consisting of an unmarked roentgenogram and a sheet of white paper, was positioned immediately in front of the stroboscope.

### 8.5.4 *Procedure followed for EEG correlates*

The EEG was recorded and the SSD administered during the baseline condition and after each of four experimental conditions, viz.:

1. Mirror staring task (subjects stared at their own reflection in a mirror for 3 minutes).



2. Photostimulation @ 4 Hz
3. Photostimulation @ 14 Hz
4. Hyperventilation

The DES was administered during the baseline condition only. The procedure followed for each subject is summarised below:

#### **8.5.4.1 Commencement and baseline measurements**

The subjects were invited to sit down in the main laboratory. Introductions and informed consent were followed by the completion of SSD1 (noting the time on the “front sheet”). The electrodes were then applied, the “front sheet” containing the demographic details was completed, and the five-stage experimental procedure was explained. The subjects were then escorted through to the smaller EEG room and the electrodes were connected to the recording apparatus. After completion of the DES, baseline EEG was recorded with the subjects’ eyes open and, as far as possible, not blinking (2 minutes). This was followed by a recording of baseline EEG with eyes closed (2 minutes). The subjects’ mental state was then monitored and “grounded” (i.e. awareness of their immediate surroundings and awareness of their immediate experiences and emotions were encouraged).

#### **8.5.4.2 Experiment 1: Mirror staring**

This experiment was a replication of the method by Miller et al. (1994). The mirror that was used was 48 × 88 cm in size and mounted on a 6 mm piece of plywood of identical size. The procedure was initiated by the setting up of the mirror on a horizontal board, placed across the armrests of the easy chair in which the subjects were seated during the EEG recording. The subjects were to hold the mirror vertically upright within arm’s length, with elbows resting on the arms of the chair, but the

mirror had to be tilted backwards just enough to aid the balance and to minimise strain on the subjects' arms. (The distance between the subjects' eyes and the mirror varied between 23 and 33 cm, depending on the body weight of the subjects and the length of their arms.) The subjects were to remain immobile and to stare at their own mirror image for 3 minutes, while EEG recording took place. Then they were requested to stare at their mirror image without blinking for the next two minutes, while EEG was being recorded. The mirror was then removed, and the SSD2 completed by the subjects, after which their mental state was again monitored and "grounded".

#### **8.5.4.3 Experiment 2: Photostimulation @ 4 Hz**

The stroboscope was switched on for 12 seconds during which the subjects stared at it without blinking. The stroboscope was then switched off for the next 5 seconds, during which time the subjects could blink and relax. The previous two steps were repeated 6 times, and the EEG recorded during the whole series. Immediately following the series of photostimulation, the SSD3 was completed and the subjects' mental state monitored and "grounded".

The epoch for each burst of photostimulation was taken as 12 seconds to allow for the artefact of opening their eyes, so that a full 10-second sweep (six times) could be available for the analysis.

#### **8.5.4.4 Experiment 3: Photostimulation @ 14 Hz**

The stroboscope was adjusted to 14 Hz while the subjects were looking away. The stroboscope was then switched on for 12 seconds while the subjects stared at it without blinking; the stroboscope was then switched off for 5 seconds during which time the subjects could blink and relax. The previous two steps were repeated 6 times,



and the EEG recorded during the whole series. Immediately afterwards the SSD4 was completed and the subjects' mental state monitored and "grounded".

#### **8.5.4.5 Experiment 4: Hyperventilation**

The procedure was explained and demonstrated to each subject: They were requested to hyperventilate at a rate of about once every 2 seconds, exhaling as much possible, with their eyes closed, for 3 minutes. Possible side-effects were explained; the subjects would stop hyperventilating if the side-effects were too uncomfortable. Hyperventilation was then started, while the EEG was recorded for 3 minutes. The subjects were then requested to stop hyperventilating and to remain immobile with their eyes closed, while the EEG was recorded for 2 more minutes. The SSD5 was then completed (noting time on "front sheet"), and the subjects' mental state was again monitored and "grounded".

#### **8.5.4.6 Ending of the procedure**

The electrodes were disconnected and the subjects escorted back to the main laboratory next door, where the electrodes were removed. The subjects' experiences were discussed, their travel expenses forms filled in, refreshments provided, the (new) combs used in removing the electrodes were given to them, and they were thanked for their participation.

### **8.5.5 Analysis of EEG correlates**

#### **8.5.5.1 Data processing and software used for EEG correlates**

##### **8.5.5.1.1 Analysis of digital EEG signals**

The “raw” analogue EEG data was visually examined and manually stripped to provide a one-minute epoch of artefact-free EEG for each experimental condition, viz. baseline with eyes open; baseline with eyes closed; staring into a mirror (a one-minute epoch after 3 minutes of staring to induce the dissociative experiences); photostimulation at a frequency of 4 Hz; photostimulation at a frequency of 14 Hz; and hyperventilation (a one-minute epoch immediately following 3 minutes of hyperventilation).

The EEG signals in the stripped epochs were then converted to a frequency domain using a Fast Fourier Transform (FFT) based on a sampling frequency of 256 Hz. FFT is a fast algorithm for digital computation of discrete Fourier transforms. The method of spectral analysis separates a waveform into its different frequency components and demonstrates the amplitudes of the different frequency sine waves of which the waveform is composed (Niedermeyer & Lopes da Silva, 1987; Duffy et al., 1989; Fisch, 1991). These component amplitudes of a Fourier series are expressed as mean square values and the resultant plot of the data is called a power spectrum.

The power of each frequency for every epoch was then summed into the 4 wavebands at set frequency intervals as predetermined by the computer software, i.e. delta (0.0 - 3.5 Hz), theta (4.0 - 7.5 Hz), alpha (8.0 - 11.5 Hz), and beta (12.0 - 15.5 Hz). From the separately saved FFT files, mean brain maps could be created, e.g., maps of absolute power in each waveband for the whole study population.



#### **8.5.5.1.2      *Comprehensive data file***

A comprehensive data file was then created in SPSS (Statistical Package for the Social Sciences) by the manual entry of the demographic information, the SSD scores, DES scores, and the EEG power values for each of the 4 wavebands at 9 electrodes (cz, f3, f4, p3, p4, t3, t4, o1, o2).

#### **8.5.5.2 Descriptive statistics of EEG correlates**

The small sample size influenced the choice of mainly non-parametric methods for the analysis of the data. However, the relatively low medians of most of the variables adversely affected the visual interpretability of the descriptive statistics. The mean values of the same variables provided a more useful visual representation when comparing the distributions of various variables, or when comparing the distribution of a single variable across experimental conditions. In order to test the desirability or undesirability of using mean values in the statistical analysis, normal distributions were fitted to the cumulative frequency distributions of those variables (cf. sections 8.5.5.2.2.2 and 8.5.5.2.3.2 below).

##### **8.5.5.2.1      *Demographic characteristics of study population***

Information on the patients' diagnosis and lateralisation of their epileptic focus, as well as their history (or lack thereof) of brain damage, brain surgery, psychiatric treatment, regular medications, age, and gender was studied.

##### **8.5.5.2.2      *SSD data***

###### **8.5.5.2.2.1      *Boxplots***

Boxplots of the distribution of SSD and subscale scores were used to illustrate the descriptive statistics over 5 experimental conditions.

#### **8.5.5.2.2.2 Distribution fitting**

Normal distributions were fitted to the observed cumulative frequency distributions of SSD and subscale scores during the baseline condition. The Kolmogorov-Smirnov test was performed in the case of each SSD subscale score.

#### **8.5.5.2.2.3 Line graphs for comparisons across experimental conditions**

##### **8.5.5.2.2.3.1 SSD subscale scores**

Multiple line graphs were used to compare mean SSD and subscale scores over 5 experimental conditions, first in the total study population, then in patients with a right-sided epileptic focus, and then in patients with a left-sided epileptic focus.

##### **8.5.5.2.2.3.2 Subgroups of the study population**

Multiple line graphs were used to compare mean SSD and subscale scores of patients with a right-sided epileptic focus and patients with a left-sided epileptic focus, over 5 experimental conditions. Similarly, multiple line graphs were used to compare median SSD and subscale scores of patients with a right-sided epileptic focus and patients with a left-sided epileptic focus, over 5 experimental conditions.

#### **8.5.5.2.3 *EEG data***

##### **8.5.5.2.3.1 Boxplots**

Boxplots of the distribution of EEG waveband power were used to illustrate the descriptive statistics over 5 experimental conditions.



#### **8.5.5.2.3.2 Distribution fitting**

Normal distributions were fitted to the observed cumulative frequency distributions of EEG waveband power during the baseline condition. The Kolmogorov-Smirnov test was performed in the case of each EEG waveband.

#### **8.5.5.2.3.3 Line graphs for comparisons across experimental conditions.**

##### **8.5.5.2.3.3.1 EEG vertex power of the 4 wavebands**

Multiple line graphs were used to compare mean power at the vertex electrode of each of the four EEG wavebands, over 5 experimental conditions, first in the total study population, then in patients with a right-sided epileptic focus, and then in patients with a left-sided epileptic focus.

##### **8.5.5.2.3.3.2 Subgroups of the study population**

Multiple line graphs were used to compare mean EEG waveband power at the vertex electrode of patients with a right-sided epileptic focus and patients with a left-sided epileptic focus, over 5 experimental conditions.

### **8.5.5.3 Confidence intervals of EEG correlates**

#### **8.5.5.3.1 *SSD and subscale scores***

The 95% confidence intervals, i.e. the ranges of values which contain the true population means with a probability of 0.95 (calculated as  $[\text{mean} - 1.96 \times \text{standard error}]$  to  $[\text{mean} + 1.96 \times \text{standard error}]$ ) were calculated for the SSD and subscale scores during the baseline condition, and for the SSD scores during the other experimental conditions. These intervals were calculated for the total study population, for the patients with a right-sided epileptic focus, and for the patients with a left-sided epileptic focus.

#### **8.5.5.3.2**      *DES and subscale scores*

Similarly, the 95% confidence intervals were calculated for the DES and subscale scores, for the total study population, for the patients with a right-sided epileptic focus, and for the patients with a left-sided epileptic focus.

#### **8.5.5.4 Assess change over 5 experimental conditions**

##### **8.5.5.4.1**      *Change of SSD variables over 5 experimental conditions*

The changes in each SSD subscale score and the total SSD score over the 5 experimental conditions were assessed using the Friedman test, a non-parametric equivalent of a one-sample repeated measures design or a two-way analysis of variance with one observation per cell (Altman, 1991). Friedman here tested the null hypothesis that the SSD scores during the 5 experimental conditions came from the same population of scores. If significant, the Friedman test would indicate that there are significant differences somewhere, i.e. significant changes in the SSD and subscale scores somewhere during the 5 experimental conditions. However, the test does not indicate which experimental condition would be responsible for the significant change in SSD or subscale score.

##### **8.5.5.4.2**      *Change of EEG variables over 5 experimental conditions*

Similarly, the changes in the power of each EEG waveband over the 5 experimental conditions were assessed using the Friedman test. The same limitations as described above would apply to the interpretation of the Friedman test for the EEG variables.

#### **8.5.5.5 Assess SSD-EEG correlations at each experimental condition:**

Although it is not in itself an adequate assessment of the relationship across experimental conditions between the SSD and the EEG variables, the correlation



between each SSD variable and each EEG variable at each experimental condition already gives an indication of possible links between dissociation and concurrent EEG correlates. The correlations were assessed at the vertex electrode.

This was done using a table of correlation coefficients for each experimental condition, and using comparative line graphs of correlation coefficients, where SSD-EEG correlation coefficients were plotted over 5 experimental conditions.

#### **8.5.5.5.1      *Tables of correlation coefficients***

Correlation matrices using Spearman's rho correlation coefficients were calculated for each experimental condition, first for the total study population, then for the patients with a right-sided epileptic focus, and then for the patients with a left-sided epileptic focus.

#### **8.5.5.5.2      *Comparative line graphs of correlation coefficients***

The correlation coefficients between the SSD variables and the EEG variables for the total study population were visually represented using multiple line graphs. For example, the correlation between the SSD and subscale scores, and delta power at the vertex electrode, during each of the 5 experimental conditions, made up one multiple line graph. Similarly, a multiple line graph was devoted to the correlations with vertex theta power, the correlations with vertex alpha power, and the correlations with vertex beta power, of the SSD and subscale scores.

#### **8.5.5.5.3      *Tables of most significant correlations***

In order to appreciate the patterns of most significant correlations between the SSD and EEG variables at each experimental condition, all correlation coefficients  $\geq 0.30$  at the vertex electrode were summarised in a single table.

#### **8.5.5.6 Assess canonical correlations between SSD and EEG variables**

The relationship between the set of SSD variables (which changed over the 5 experimental conditions) and the set of EEG variables (which changed over the 5 experimental conditions) was then assessed using canonical analysis, a procedure used specifically for assessing the simultaneous relationship between different sets of variables.

Based on the overall correlation matrix of all the variables, the essence of canonical analysis is the correlation of all possible sets of weighted sums of the responses to the one variable, with all possible sets of weighted sums of the measurements of the other variable. The weights are determined in such a way that the weighted sums correlate maximally with each other. The weighted sums then define canonical roots or canonical variates, and the number of canonical roots extracted will be equal to the minimum number of variables in either set. Each successive canonical root will explain a unique additional proportion of variability in the different sets of variables. As an overall index of the canonical correlation between the different sets of variables, the largest correlation, i.e. the correlation for the first root, is reported as  $R$ . The significance of the roots is then evaluated, first the significance of all roots combined, then the significance of the roots remaining after removing the first root, the second root, etc. The canonical weights show how each variable in each set contributes uniquely to the respective weighted sum (canonical root). Squared canonical correlations and the variance extracted by each root then contribute towards a measure of redundancy, i.e. how redundant one set of variables is, given the other set of variables. The redundancy measure indicates how much of the actual variability in one set of variables is explained by the other set, and ensures a realistic appraisal of how much actual variance (in the variables) is accounted for by a



canonical root. The redundancies for a particular root can be interpreted as the average proportion of variance accounted for in the respective set of variables by that root, given the variables in the other set (STATISTICA Help file).

One of the assumptions underlying canonical analysis is that the data are normally distributed. In this case, the results of the fitting of normal distributions to the observed cumulative frequency distributions of the SSD and EEG variables, and the results of the Kolmogorov-Smirnov tests were taken to justify the use of this analytic technique in a sample of this size.

The small sample size unfortunately precluded a differential analysis of the subgroups of patients with right-sided and left-sided epileptic foci, since one of the requirements is that the sample size has to be at least two more than the number of variables in the analysis. Therefore, the data of the *whole* study population were subject to the canonical analysis. The analysis required pair-wise comparisons during two experimental conditions at a time, i.e. first, the canonical correlation between the baseline-SSD and the mirror-SSD variables, and the baseline-EEG and the mirror-EEG variables; second, the canonical correlation between the baseline-SSD and the 4 Hz photostimulation-SSD variables, and the baseline-EEG and the 4 Hz photostimulation-EEG variables; third, the canonical correlation between the baseline-SSD and the 14 Hz photostimulation-SSD variables, and the baseline-EEG and the 14 Hz photostimulation-EEG variables; and fourth, the canonical correlation between the baseline-SSD and the hyperventilation-SSD variables, and the baseline-EEG and the hyperventilation-EEG variables.

#### 8.5.5.6.1 *Tables of canonical correlations at vertex: 4 wavebands × 4 conditions*

First, canonical correlations were assessed for the 4 pairs of experimental conditions, using EEG data from the vertex electrode.

#### 8.5.5.6.2 *Tables of canonical correlations at other electrodes (f3, f4, p3, p4, t3, t4, o1, o2): 4 wavebands × 4 conditions*

Then canonical correlations were assessed for the 4 pairs of experimental conditions, using EEG data from the other 8 identified electrodes.

#### 8.5.5.6.3 *Tables indicating patterns of significant canonical correlations*

Subsequently, summary tables were created indicating the patterns of *significant* canonical correlations, i.e. for each SSD or subscale score, the significant canonical correlations were indicated in a separate table, according to EEG waveband, experimental condition, and electrode.

#### 8.5.5.6.4 *Additional illustration of significant relationships*

The main findings about the relationship between the SSD and EEG variables were visually summarised in two ways:

##### 8.5.5.6.4.1 *Selected scatterplot matrices*

Using the pattern of significant canonical correlations between the SSD and EEG variables referred to under section 8.5.5.6.3 above as a guide, scatterplot matrices illustrating the relationship between SSD and EEG variables during a specific experimental condition were selected to demonstrate where (during which experimental condition and at which electrode) possible links existed between dissociation and concurrent EEG correlates.



#### 8.5.5.6.4.2 Selected brain maps

Also using the pattern of significant canonical correlations between the SSD and EEG variables referred to under section 8.5.5.6.3 above as a guide, brain maps of the mean power in the 4 wavebands were selected to provide a visual comparison of the most prominent EEG differences between experimental conditions.

### 8.6 *Summary of design and methods to examine EEG correlates*

The design and methods were planned in such a way as to test the sensitivity of the SSD to experimentally induced temporal variability of dissociation, and its suitability to study concurrent EEG correlates. The results would describe the concurrent relationship between the SSD variables and the EEG variables during the experimental induction of dissociative experiences, and would test hypotheses of links between dissociation and each of the different EEG wavebands, as identified in the objectives (section 8.2). The implications of the concurrent EEG correlates for the symptomatological clustering of dissociative symptoms, and for the relationship between state and trait dissociation, would be examined.

**Table 8.1 Procedure for EEG**

correlates

**1. Commencement and baseline measurements**

- Sit down; introductions
- Explain procedure
- Informed consent
- To complete baseline SSD
- Apply electrodes
- Complete demographic information
- Through to EEG room
- Connect electrodes
- To complete DES
- EEG recording: eyes open (2 min) and closed (2 min)
- Mental state monitored and “grounded”

**2. Experiment 1: Mirror staring**

- Explain experiment
- Mirror set up and held
- To stare at own mirror image for 3 minutes
- To remain immobile while continuing to stare (2 min)
- EEG recording throughout
- Mirror removed
- To complete SSD2
- Mental state monitored and “grounded”

**3. Exp. 2: Photostim. @ 4 Hz**

- Explain experiment
- Stroboscope on for 12 s; off for 5 s; on for 12 s; etc.

- Repeat sequence 6 times
- EEG recording throughout
- To complete SSD3
- Mental state monitored and “grounded”

**4. Exp. 3: Photostim. @ 14 Hz**

- Explain experiment
- Stroboscope on for 12 s; off for 5 s; on for 12 s; etc.
- Repeat sequence 6 times
- EEG recording throughout
- To complete SSD4
- Mental state monitored and “grounded”

**5. Exp. 4: Hyperventilation**

- Explain experiment
- To hyperventilate at a rate of once every 2 s, for 3 min
- Stop hyperventilating; remain immobile
- EEG recording throughout
- To complete SSD5
- Mental state monitored and “grounded”

**6. Ending**

- Electrodes disconnected
- Back to main lab
- Remove electrodes
- Discuss their experiences
- Arrange reimbursement of travel expenses
- Refreshments and comb
- Thank you



Figure 8.1 SSD and subscale scores over 5 conditions (n=1)

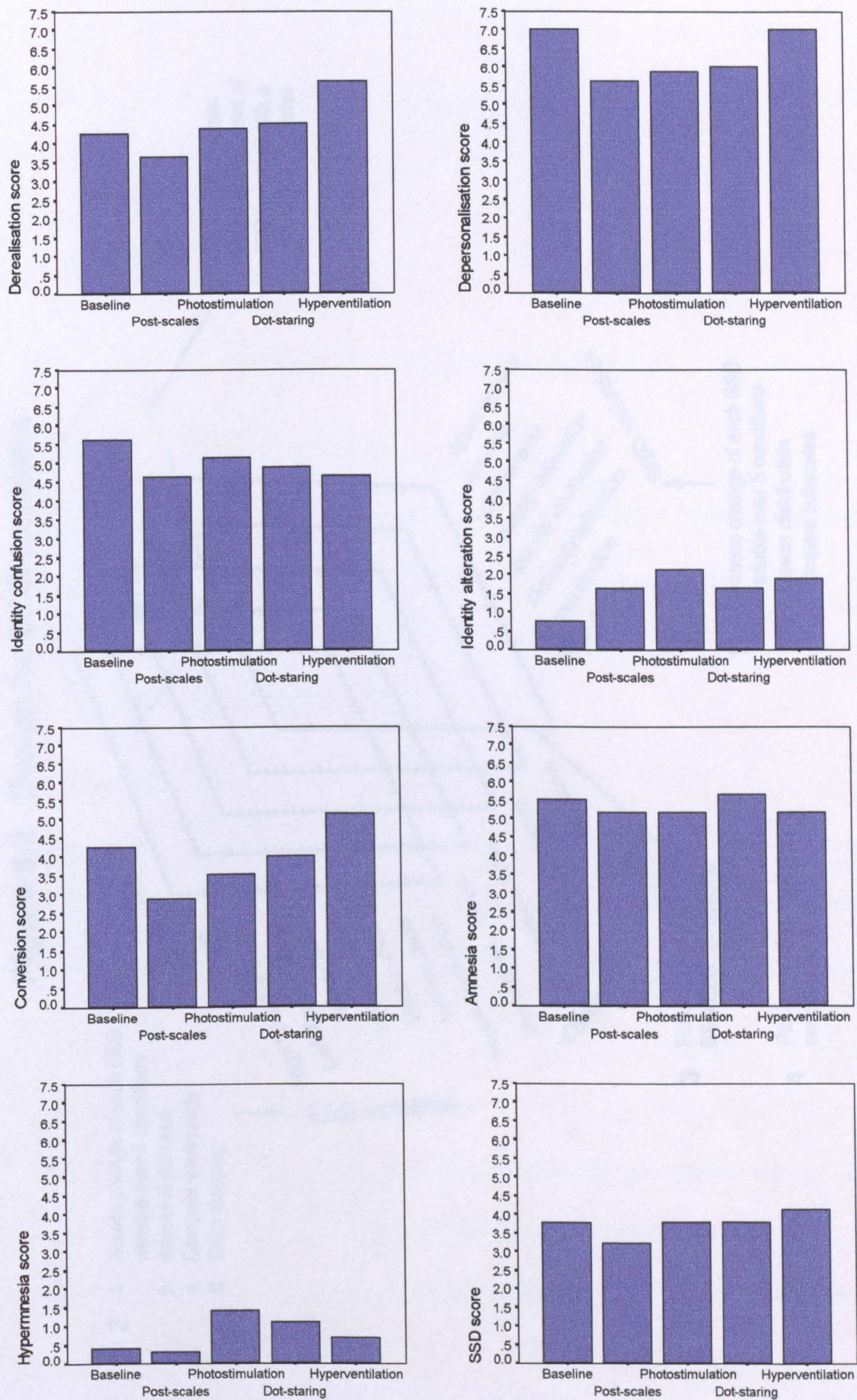
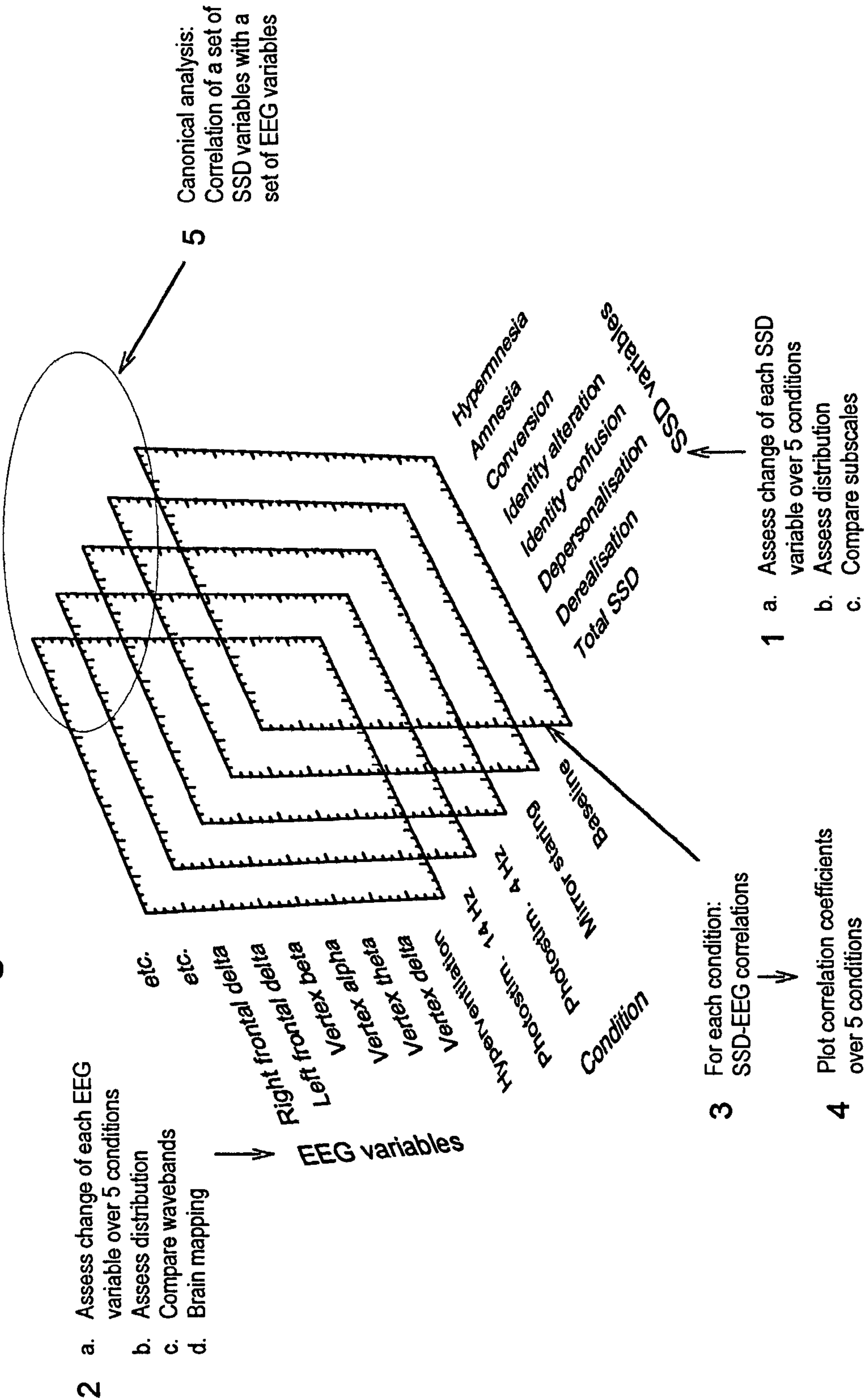




Figure 8.2 Design for EEG correlates





## EEG correlates: Results

### **9.1 *Descriptive statistics***

#### **9.1.1 *Demographic characteristics of study population***

##### **9.1.1.1 Diagnosis and epileptic focus**

All 11 subjects had a diagnosis of temporal lobe epilepsy; 7 had a right-sided epileptic focus and 4 had a left-sided epileptic focus. The focus could be seen clearly in the brain maps of 7 of the 11 subjects (all 4 of the subjects with a left-sided focus, and 3 of the 7 subjects with a right-sided focus).

##### **9.1.1.2 Medication**

All subjects were receiving anticonvulsant medications, singly or more commonly a combination of anticonvulsant medications. One of the subjects with a right-sided epileptic focus also suffered from diabetes mellitus and was receiving a combination of anticonvulsant medication and insulin.

##### **9.1.1.3 Brain damage or surgery**

Of the 11 subjects, 8 gave a history of brain damage in the past (before the age of 10 years), that included traumatic events such as a head injury caused by a brick, and medical causes such as meningitis. Of these 8 subjects, 5 had a right-sided epileptic focus and 3 had a left-sided focus.

Three of the 11 subjects had undergone brain surgery for their epilepsy during the previous year. Two of those subjects had surgery for a right-sided epileptic focus and one for a left-sided focus. The patient with a left-sided focus who had undergone surgery, gave no previous history of brain damage.

#### **9.1.1.4 Psychiatric history**

None of the 11 subjects had a current comorbid psychiatric diagnosis. However, 2 of the 11 subjects gave a history of psychiatric treatment in addition to that related to their epilepsy. The one subject, a 53-year-old woman with a right-sided focus, who had sustained a head injury from a brick at the age of 9 years, gave a history of seeing a psychiatrist once at the age of 31 years (7 years after her epilepsy started), after an episode of shoplifting. The other subject, a 23-year-old man with a left-sided focus, who had sustained seizure-related brain damage around the age of 5 years, gave a history of seeing a psychiatrist 3 years previously, during an episode of depression.

#### **9.1.1.5 Age, gender**

The mean age of the 11 subjects, given as mean  $\pm$  standard deviation, was  $37.36 \pm 9.05$  years; for the group with a right-sided epileptic focus it was  $38.14 \pm 9.77$  years, and for the group with a left-sided epileptic focus it was  $36.00 \pm 8.83$  years. The gender distribution was the following: of the 11 subjects, 5 were male and 6 female; of the 7 right-sided focus subjects, 4 were male and 3 female; of the 4 left-sided focus subjects, 1 was male and 3 were female.



## **9.1.2 SSD data**

### **9.1.2.1 Boxplots**

Figures 9.1.1 - 9.1.8 show the boxplots of the distribution of SSD and subscale scores over 5 experimental conditions. The results of the Friedman test for the respective SSD subscales are presented together with the boxplots. Although not strictly a part of the descriptive statistics, and referred to again below, the Friedman test results are better interpretable when juxtaposed with the graphical representation of the relevant distributions.

### **9.1.2.2 Distribution fitting**

Figure 9.3.1 shows the result of the fitting of normal distributions to the observed cumulative frequency distributions of the SSD and subscale scores during the baseline condition. The Kolmogorov-Smirnov test was performed for each SSD subscale and the value of the Kolmogorov-Smirnov one-sample D statistic is given at the top of each histogram. The Kolmogorov-Smirnov test is non-significant in all eight tests, suggesting the non-rejection of the hypothesis that the SSD and subscale data follow a normal distribution. The possibility therefore remains that the SSD variables may be normally distributed.

### **9.1.2.3 Line graphs to compare**

#### **9.1.2.3.1 *SSD subscale scores***

Figure 9.4.1 shows a multiple line graph that compares mean SSD and subscale scores over 5 experimental conditions, for the total study population. From Figure 9.4.1 can be seen that the depersonalisation, derealisation, and conversion subscales of the SSD underwent the greatest increase during the hyperventilation condition and, to a lesser

extent, also during the mirror-staring condition. This pattern of subscale reactivity is similar to that reported in the results of the pilot study to the EEG correlates (Chapter 8, section 8.3). Figures 9.4.2 and 9.4.3 show similar multiple line graphs that compare mean SSD and subscale scores over 5 experimental conditions for the patients with a right-sided epileptic focus and patients with a left-sided epileptic focus respectively. To a lesser extent than for the total study population, the same pattern is evident in the population subgroups for the derealisation, depersonalisation, and conversion subscales of the SSD.

#### *9.1.2.3.2 Subgroups of the study population*

Figure 9.4.4 shows multiple line graphs comparing mean SSD and subscale scores of patients with a right-sided epileptic focus and patients with a left-sided epileptic focus, over 5 experimental conditions. This figure represents a different way of representing the information summarised in Figures 9.4.1 - 9.4.3 visually. Inspection of Figure 9.4.4 singles out the hypermnesia subscale of the SSD as the one where the patients with right-sided and left-sided foci differ the most, regardless of experimental condition - patients with a right-sided focus consistently experience more hypermnesic symptoms than patients with a left-sided focus. On the whole, the SSD and subscale scores of the patients with a left-sided focus appear less reactive to the experimental conditions than the SSD and subscale scores of the patients with a right-sided focus.

Figure 9.4.5 shows multiple line graphs comparing median SSD and subscale scores of patients with a right-sided epileptic focus and patients with a left-sided epileptic focus, over 5 experimental conditions. The scale of the Y-axis is identical in all the mini-charts, in the interest of easy visual comparison. From this figure can be



seen that the pattern of most prominent increase during the hyperventilation condition of depersonalisation, derealisation, and conversion subscale scores (referred to above under section 9.1.2.3.1) is mostly due to the patients with a right-sided epileptic focus.

### *9.1.3 EEG data*

#### **9.1.3.1 Boxplots**

Figures 9.2.1 - 9.2.4 show the boxplots of the distribution of EEG waveband power over 5 experimental conditions. The results of the Friedman test for the respective EEG wavebands are presented together with the boxplots. Although not strictly a part of the descriptive statistics, and referred to again below, the Friedman test results are better interpretable when juxtaposed with the graphical representation of the relevant distributions.

#### **9.1.3.2 Distribution fitting**

Figure 9.3.2 shows the result of the fitting of normal distributions to the observed cumulative frequency distributions of EEG waveband power during the baseline condition. The Kolmogorov-Smirnov test was performed for each EEG waveband and the value of the Kolmogorov-Smirnov one-sample D statistic is given at the top of each histogram. The Kolmogorov-Smirnov test is non-significant in all tests, suggesting the non-rejection of the hypothesis that the EEG data follow a normal distribution. The possibility therefore remains that the EEG variables may be normally distributed.

### **9.1.3.3 Line graphs to compare**

#### **9.1.3.3.1      *EEG vertex power of the 4 wavebands***

Figure 9.5.1 shows a multiple line graph that compares mean EEG waveband power at the vertex electrode over 5 experimental conditions for the total study population. From Figure 9.5.1 can be seen that the vertex delta and theta power underwent the greatest increase during the hyperventilation condition; to a lesser extent, vertex alpha and beta power also increased during the hyperventilation condition. Figures 9.5.2 and 9.5.3 show similar multiple line graphs that compare mean EEG waveband power at the vertex electrode over 5 experimental conditions, for the patients with a right-sided epileptic focus and patients with a left-sided epileptic focus respectively. The same pattern for both population subgroups is evident for the waveband power during the hyperventilation condition.

#### **9.1.3.3.2      *Subgroups of the study population***

Figure 9.5.4 shows multiple line graphs comparing mean EEG waveband power at the vertex electrode of patients with a right-sided epileptic focus and patients with a left-sided epileptic focus over 5 experimental conditions. This figure represents a different way of representing the information summarised in Figures 9.5.1 - 9.5.3 visually. The scale of the Y-axis is identical in all the mini-charts, in the interest of easy visual comparison. Inspection of Figure 9.5.4 singles out theta power as the waveband where the patients with right-sided and left-sided foci differ the most, regardless of experimental condition - patients with a right-sided focus consistently show more theta power at the vertex electrode than patients with a left-sided focus. To a lesser extent, the same could be said for alpha power. However, testing of the differences between the patients with a right-sided focus and patients with a left-sided focus,



using the Mann-Whitney test at several electrodes, yielded significant results only for theta power, and only at the vertex electrode or at the right-sided electrodes (Table 9.1.1) (no Bonferroni correction applied).

The differences in mean theta power between the patients with a right-sided focus and patients with a left-sided focus, at the right-sided electrodes and left-sided electrodes respectively, are represented visually in Figure 9.5.5. Again, the scale of the Y-axis is identical in all the mini-charts, in the interest of easy visual comparison. From Figure 9.5.5 can be seen that the patients with a right-sided focus showed higher theta power than the patients with a left-sided focus, and especially so at the right-sided electrodes.

## **9.2 *Confidence intervals***

### **9.2.1 *SSD and subscale scores***

Table 9.1.2 summarises the mean SSD and subscale scores during the baseline condition, and the mean SSD scores during the other experimental conditions, as well as the 95% confidence intervals of those scores, for the total study population, for the patients with a right-sided epileptic focus, and for the patients with a left-sided epileptic focus.

### **9.2.2 *DES and subscale scores***

Table 9.1.3 summarises the mean DES and subscale scores, as well as the 95% confidence intervals of those scores, for the total study population, for the patients with a right-sided epileptic focus, and for the patients with a left-sided epileptic focus.

### **9.3 *Assess change over 5 conditions***

This change refers to internal change within the set of, for example, SSD variables, not taking into account any change in the EEG variables, and vice versa.

#### **9.3.1 *Change of SSD variables***

Figures 9.1.1 - 9.1.8 also include the results of the Friedman tests performed on the SSD and subscale scores of the total study population over the 5 experimental conditions. The Friedman test was significant for the SSD subscales of depersonalisation and conversion, suggesting the rejection of the hypothesis that the 5 scores came from the same population of scores. The Friedman test therefore indicates significant differences among the distributions of depersonalisation scores during the different experimental conditions, and among the distributions of conversion scores during the different experimental conditions.

#### **9.3.2 *Change of EEG variables***

Figures 9.2.1 - 9.2.4 also include the results of the Friedman tests performed on the power of each of the 4 EEG wavebands of the total study population over the 5 experimental conditions. The Friedman test was significant for all 4 the EEG wavebands, indicating significant differences among the distributions of EEG delta power during the different experimental conditions, and the same for theta, alpha, and beta power.



## **9.4 *Assess SSD-EEG correlations at each experimental condition***

### **9.4.1 *Tables of correlation coefficients***

Tables 9.2.1 - 9.2.18 summarise the Spearman's rho correlation coefficients between each SSD variable and each EEG variable at the vertex electrode, during each experimental condition, for the total study population, for the patients with a right-sided epileptic focus, and for the patients with a left-sided epileptic focus. Note that the correlation coefficients between the SSD and EEG variables for the total study population were visually represented in Figures 9.6.1 - 9.6.4. Few of the correlation coefficients in Tables 9.2.1 - 9.2.18 were significant. Note the correlation between derealisation and vertex beta power, and between identity confusion and vertex beta power, during photostimulation at 4 Hz, as well as the correlation between derealisation and vertex theta power, during photostimulation at 4 Hz (all in Table 9.2.10). Note also the correlation between identity alteration and right-sided and left-sided theta power during hyperventilation (Table 9.2.16).

### **9.4.2 *Comparative line graphs of correlation coefficients***

Figures 9.6.1 - 9.6.4 illustrates the Spearman's rho correlation coefficients of the SSD and subscale scores with each EEG waveband in turn, over the 5 experimental conditions, using the results for the total study population. The significant coefficients highlighted in the previous paragraph also stand out in the graphs. In Figure 9.6.1 the correlation coefficient of 0.44 between identity alteration and vertex delta power during hyperventilation was not significant. In Figure 9.6.2 the correlation between derealisation and vertex theta power during photostimulation at a frequency of 4 Hz, of 0.61 was significant at the 0.05 level. In the same figure, the correlation between

identity alteration and vertex theta power during hyperventilation of 0.48 was not significant, but was significant for right-sided theta and left-sided theta considered separately. In Figure 9.6.3 the correlation between identity alteration and vertex alpha power during hyperventilation of 0.53 was not significant. None of the other correlation coefficients between the SSD or subscale scores and vertex alpha power was significant. In Figure 9.6.4 the correlation between derealisation and vertex beta power during photostimulation at 4 Hz, of 0.76 was significant at the 0.01 level. The correlation between identity confusion and vertex beta power during photostimulation at 4 Hz, of 0.74 was also significant at the 0.01 level. Also in Figure 9.6.4 the correlation between depersonalisation and vertex beta power during hyperventilation of 0.57 was not significant.

#### *9.4.3 Tables of most significant correlations*

Table 9.3 summarises the largest Spearman's rho correlation coefficients at each experimental condition, for the total study population.

### **9.5 *Assess canonical correlations between SSD and EEG variables***

The canonical correlations were calculated separately for each combination of four variables, namely a baseline SSD variable, an experimental SSD variable, a baseline EEG variable, and an experimental EEG variable. The results of each of these canonical analyses at the vertex electrode were summarised in a single row in Tables 9.4.1 - 9.4.16. In the interest of clarity and comprehensibility, the canonical analyses at the other electrodes were summarised even more concisely in Tables 9.5.1 - 9.5.36. All of these tables were presented again, in a different way, to display only the



canonical correlations that were significant at the 0.05 or 0.02 levels (Tables 9.6.1 - 9.6.8). Thus, Tables 9.6.1 - 9.6.8 are summary tables of the former summary tables.

### *9.5.1 Summary tables of canonical correlations at vertex: 4 wavebands × 4 conditions*

Tables 9.4.1 - 9.4.16 contain the results of the canonical analyses of the relationship between the SSD and subscale scores and vertex power in the 4 wavebands during each of 4 experimental conditions (mirror staring; photostimulation at 4 Hz; photostimulation at 14 Hz; hyperventilation), each of these four conditions coupled to the baseline condition. The mirror staring and photostimulation conditions were coupled to the baseline condition with eyes open, whereas the hyperventilation condition was coupled to the baseline condition with eyes closed, in order to keep the status of the eyes constant during the canonical analysis.

Table 9.4.1 summarises the canonical correlations between the SSD and subscale scores on the one hand, and vertex delta power on the other, during the mirror-staring experiment only. The first column denotes the SSD subscales (derealisation, depersonalisation, identity confusion, identity alteration, conversion, amnesia, hypermnesia, and the total SSD). The second column, titled *Canonical R*, denotes the correlation between the first and most significant canonical variates in each set (the first canonical root that is extracted) (see Chapter 8). The third column, titled *Canonical R-square*, denotes the squared canonical correlations that are also the Eigen values. The squared canonical correlations are also used in the computation of the redundancies (last two columns). The following 3 columns, *Chi-square*, *degrees of freedom*, and *p-level*, reflect the significance of the canonical root that was reported. Sequential significance testing, as a part of the program, showed that none

of the canonical analyses yielded more than one significant canonical root. Analyses where the canonical correlation was statistically significant at the 0.05 level, or where the correlation approached that level of significance were highlighted in bold type in these tables. The column titled *Lambda prime* depends on the squared canonical correlation. Lambda is an estimate of the unexplained variance between two canonical variates. It is used as a test of significance for the squared canonical correlation, i.e. for the common variance between 2 canonical variates. The second-last column titled *Redundancy of root 1 (subscale)* can be interpreted as the average proportion of variance accounted for in that set of, for example, derealisation scores by that canonical root, given the variables in the set of vertex delta power values. The last column titled *Redundancy of root 1 (delta)* can be interpreted as the average proportion of variance accounted for in that set of vertex delta power values by that canonical root, given the variables in the set of, for example, derealisation scores.

Similarly, Table 9.4.2 summarises the results of the canonical analyses between the SSD and subscale scores on the one hand, and vertex delta power on the other, during the experiment of photostimulation at a frequency of 4 Hz only; and so forth for the other tables in this set (Tables 9.4.3 - 9.4.16).

Table 9.4.1 demonstrates the statistically significant canonical correlations between vertex delta power and the scores for each of the following SSD subscales: identity confusion, identity alteration, conversion, hypermnesia, and the total SSD score - during the mirror-staring condition. However, from Figure 9.6.1 can be seen that the Spearman's rho correlation between vertex delta power and each of the SSD subscale scores during the mirror-staring condition only (considered on its own, and not coupled to the baseline condition), was a negative correlation, i.e. an inverse



relationship existed between the variables. These significant canonical correlations in Table 9.4.1 therefore did not contribute meaningfully to the study of the relationship between dissociation and EEG correlates.

On the other hand, Table 9.4.8 demonstrates the statistically significant canonical correlations between vertex theta power and the scores for the SSD subscales of depersonalisation and amnesia, a relationship that is in line with the hypothesised link between dissociation and theta activity. These canonical correlations concur with the positive Spearman's rho correlation coefficients between these SSD subscales and vertex theta power during the hyperventilation condition only (considered on its own, and not coupled to the baseline condition) (Figure 9.6.2), and also concur with the changes in the individual variables over the various experimental conditions as illustrated in Figures 9.1.3; 9.1.7; 9.2.2; 9.4.1; and 9.5.1.

Note that Tables 9.4.1 - 9.4.16 all refer to vertex EEG variables. Following these are Tables 9.5.1 - 9.5.36, which also include the canonical correlations at other electrodes.

### *9.5.2 Summary tables of canonical correlations at other electrodes (f3, f4, p3, p4, t3, t4, o1, o2): 4 wavebands $\times$ 4 conditions*

Tables 9.5.1 - 9.5.36 summarise the results of the canonical analyses of the relationship between the SSD and subscale scores and EEG power at 9 different electrodes, in the 4 wavebands, during each of the same 4 experimental conditions as described under section 9.5.1 above. In these tables only the figures for the canonical correlation and the associated p-value (in brackets) were reported.

Tables 9.5.1 - 9.5.4 represent a summary of Tables 9.4.1 - 9.4.16. For example, Table 9.5.1 summarises the canonical correlations between the SSD and subscale scores on the one hand (the rows), and power at the vertex electrode of all 4 wavebands (delta, theta, alpha, and beta) on the other hand (the columns), during the mirror-staring experiment only. Similarly, Table 9.5.2 summarises the canonical correlations between the same variables during photostimulation at a frequency of 4 Hz only. The canonical correlations between the SSD and the EEG variables during all 4 experimental conditions at a single electrode are therefore summarised on one page (e.g., all canonical correlations between the SSD and the EEG variables at the vertex electrode are summarised on the page consisting of Tables 9.5.1 - 9.5.4; similarly, all canonical correlations between the SSD and the EEG variables at the left mid-temporal electrode are summarised on the page consisting of Tables 9.5.5 - 9.5.8; et cetera). In these tables only canonical correlation coefficients that were significant at the 0.02 level were indicated in bold type.

For example, Table 9.5.1 demonstrates more concisely the significant canonical correlations between the SSD variables and delta power at the vertex electrode, which were first presented in Table 9.4.1. Another example is the statistically significant canonical correlation between the amnesia subscale of the SSD and theta power at the left mid-temporal electrode during hyperventilation demonstrated by Table 9.5.8. This relationship between amnesia and theta activity during hyperventilation was demonstrated at all the electrodes. A further example is that Table 9.5.26 demonstrates the highly significant canonical correlations between all the SSD subscales (with the exception of the hypermnesia subscale) and beta power at the right parietal electrode during photostimulation at a frequency of 4 Hz. The latter results concur with the positive Spearman's rho correlation coefficients



between these SSD subscales and beta power at the vertex electrode during photostimulation at a frequency of 4 Hz only (considered on its own, and not coupled to the baseline condition) (Figure 9.6.4).

The amount of information summarised in these tables complicates their interpretation. Hence, the results were simplified further by conflating all canonical correlations between a single set of subscale scores and all four wavebands at all electrodes during all experimental conditions into a single table, and merely indicating where the canonical correlations were statistically significant (see below, Tables 9.6.1 - 9.6.8).

*9.5.3 Summary tables indicating patterns of significant canonical correlations*

Tables 9.6.1 - 9.6.8 summarise the patterns of significant canonical correlations for each set of SSD or subscale scores, according to EEG waveband, experimental condition, and electrode. For example, Table 9.6.1 represents a summary of the lowermost row in each of Tables 9.5.1 - 9.5.36. There are 8 tables, one for the total SSD score and one for each SSD subscale score. In Table 9.6.1 (for the total SSD score) each row denotes a different electrode (cz - vertex electrode; f3 - left frontal electrode; p3 - left parietal electrode; t3 - left mid-temporal electrode; o1 - left occipital electrode; f4 - right frontal electrode; p4 - right parietal electrode; t4 - right mid-temporal electrode; o2 - right occipital electrode). The first 4 columns in Table 9.6.1 denote delta power, the second 4 columns theta power, the following 4 columns alpha power, and the last 4 columns beta power. Each of the 4 columns referring to delta power denotes a different experimental condition (mir - mirror staring; 4 Hz -

photostimulation at a frequency of 4 Hz; 14 Hz - photostimulation at a frequency of 14 Hz; HV - hyperventilation), and so forth for the other three wavebands.

Significant canonical correlations (from Tables 9.5.1 - 9.5.36) were indicated by asterisks in tables 9.6.1 - 9.6.8. For these tables, all canonical correlation coefficients significant at the 0.05 level were included, but the asterisks differentiate between those significant at the 0.05 level and those significant at the 0.02 level.

Four observable patterns can be distinguished:

#### **9.5.3.1 Amnesia and theta during hyperventilation**

The most prominent pattern is evident for the amnesia subscale of the SSD. Amnesia showed significant canonical correlations (mostly at the 0.02 level) with theta power during hyperventilation at all electrodes (Table 9.6.7). Similarly, but to a lesser extent, the depersonalisation subscale of the SSD showed significant canonical correlations with theta power during hyperventilation at several electrodes (cz, f3, t3, o1, o2) (Table 9.6.3). In addition, the hypermnesia subscale showed significant canonical correlations with theta power during hyperventilation at 2 electrodes (p4, t4) (Table 9.6.8). These 3 subscales (amnesia, depersonalisation, and hypermnesia) are probably responsible for the significant canonical correlations between the total SSD score and theta power during hyperventilation (Table 9.6.1).

The results suggest an association between the dissociative symptoms of amnesia, depersonalisation, and hypermnesia on the one hand, and theta activity on the other, and this association was specific to the condition of hyperventilation.

#### **9.5.3.2 Hypermnesia and the t4 electrode**

The hypermnesia subscale of the SSD showed significant canonical correlations with several wavebands across several conditions at the t4 electrode (Table 9.6.8). To a



lesser extent, a similar pattern is seen for the amnesia and depersonalisation subscales of the SSD (Tables 9.6.7 and 9.6.3).

The results suggest an association between the dissociative symptom of hypermnesia (and to a lesser extent amnesia and depersonalisation) on the one hand, and general activity at the t4 electrode on the other, and this association was not specific to any of the experimental conditions.

#### **9.5.3.3 Identity confusion and alpha / beta during 4 Hz photostimulation**

The identity confusion subscale of the SSD showed significant canonical correlations with alpha and even more so with beta power during photostimulation at a frequency of 4 Hz, at several electrodes (Table 9.6.4).

The results suggest an association between the dissociative symptom of identity confusion and fast wave activity, and the association was the most prominent during the condition of photostimulation at 4 Hz. In addition to this specific effect, the other subscales of the SSD (except the hypermnesia subscale) also showed significant canonical correlations with beta power during photostimulation at a frequency of 4 Hz, at both parietal electrodes, both occipital electrodes, and the right frontal electrode.

#### **9.5.3.4 Identity alteration and delta during hyperventilation**

The identity alteration subscale of the SSD showed significant canonical correlations with delta activity at both frontal electrodes, during the condition of hyperventilation (Table 9.6.5). To a lesser extent, a similar pattern is seen for the identity confusion and depersonalisation subscales of the SSD (Tables 9.6.4 and 9.6.3) (see also Tables 9.5.16 and 9.5.20). These results concur with the positive Spearman's rho correlation coefficients between these SSD subscales and delta power at the vertex electrode

during hyperventilation only (considered on its own, and not coupled to the baseline condition) (Figure 9.6.1).

The results suggest an association between the dissociative symptom of identity alteration (and to a lesser extent identity confusion and depersonalisation) and delta EEG activity at the frontal electrodes, and the association was the most prominent during the condition of hyperventilation.

#### **9.5.3.5 Depersonalisation**

The depersonalisation subscale of the SSD showed several significant canonical correlations with several wavebands during several experimental conditions at several electrodes.

### ***9.5.4 Additional illustration of significant relationships***

#### **9.5.4.1 Selected scatterplot matrices**

Certain scatterplot matrices of the relationship between SSD and EEG variables were selected to illustrate in a different way the significant SSD-EEG canonical correlations. Although these figures represent relationships during one experimental condition at a time, they all concur with the significant canonical correlations.

Figure 9.7.1 illustrates the relationship between SSD score and beta power during photostimulation at a frequency of 4 Hz, especially at the parietal electrodes. The detailed scatterplots at the bottom of Figure 9.7.1 demonstrates that the R-squared value is much higher at the right parietal electrode than at the right occipital electrode.

Figure 9.7.2 illustrates the relationship between hypermnesia and alpha power during photostimulation at a frequency of 14 Hz, at the temporal electrodes.



Figure 9.7.3 illustrates the inverse relationship between the SSD score and delta power, during mirror staring especially, but also during photostimulation at a frequency of 4 Hz.

Figure 9.7.4 illustrates the relationship between amnesia and theta power during hyperventilation at all electrodes. Figure 9.7.5 compares the amnesia / beta relationship with the amnesia / theta relationship during the other three experimental conditions at the right parietal electrode, i.e. where the SSD / beta relationship was the most prominent (Figure 9.7.1).

Figure 9.7.6 illustrates the relationship between three of the SSD subscales (identity alteration, identity confusion, and depersonalisation) and delta power during hyperventilation, at the frontal electrodes. The relationship responsible for the highest R-squared value, i.e. the relationship between identity alteration and delta power during hyperventilation at the left frontal electrode was chosen for a comparison between the relative roles of beta and delta power.

Figure 9.7.7 illustrates the relationship between the SSD subscale of identity alteration and beta power (left-hand column) or delta power (right-hand column), at the left frontal electrode, during all the experimental conditions. Mean linear regression lines, with a 95% confidence interval and the constant included in the equation, were fitted to the scatterplot matrices. The figure shows how the identity alteration / beta relationship starts to manifest during photostimulation at a frequency of 4 Hz, whereas the identity alteration / delta relationship only develops fully during hyperventilation. The same comparisons were also performed at the right frontal electrode; they yielded similar results.

#### **9.5.4.2 Selected brain maps**

Figure 9.8 shows a comparison of the absolute power in the delta, theta, alpha, and beta wavebands, during the baseline condition with eyes closed (top 4 brain maps), with the absolute power in the same wavebands, during the hyperventilation condition (bottom 4 brain maps). The maps and tabulated values represent the mean waveband power for the sample of 11 subjects. The maps illustrate visually what was demonstrated in more detail and confirmed by the Friedman test in Figures 9.2.1 - 9.2.4, namely that the experimental design resulted in significant changes in the absolute power of all 4 wavebands at the vertex electrode. The maps also illustrate visually what can be gleaned from the adjacent tabulated values - the almost global increase in the power of all 4 wavebands during the hyperventilation condition. The exception was alpha power, which decreased slightly (and predictably) at the occipital electrodes.

However, these increases in absolute power of the 4 wavebands only have meaning for dissociation insofar as the canonical analyses of the relationship between the SSD variables and the EEG variables indicate a significant canonical correlation between certain SSD variables and certain EEG variables during certain experimental conditions (Tables 9.6.1 - 9.6.8).

### **9.6     *Summary of main findings***

The main findings of the relationship between the SSD and EEG variables can be summarised as follows:



### *9.6.1 Relationships dependent on experimental stimulation*

1. The results suggest an association between the dissociative symptoms of amnesia, depersonalisation, and hypermnesia on the one hand, and theta activity on the other, and this association was specific to the condition of hyperventilation.
2. The results suggest an association between the dissociative symptom of identity confusion and fast wave (alpha and beta) activity, and the association was the most prominent during the condition of photostimulation at 4 Hz.
3. The results suggest an association between the dissociative symptom of identity alteration (and to a lesser extent identity confusion and depersonalisation) and delta activity at the frontal electrodes, and the association was the most prominent during the condition of hyperventilation.

### *9.6.2 Relationships independent of experimental stimulation*

1. The results suggest an association between the dissociative symptom of hypermnesia (and to a lesser extent amnesia and depersonalisation) on the one hand, and general activity at the t4 electrode on the other, and this association was not specific to any of the experimental conditions.
2. The depersonalisation subscale of the SSD showed several significant canonical correlations with several wavebands during several experimental conditions at several electrodes.

These results are discussed further in Chapter 10.

Table 9.1.1

Mann-Whitney U test:  
Differences in theta power between patients with right-sided (n=7) and patients with left-sided (n=4) epileptic foci

<i>Condition</i>	<i>Electrode</i>	<i>Rank sum R-focus</i>	<i>Rank sum L-focus</i>	<i>U</i>	<i>Z</i>	<i>P</i>
Baseline	Vertex *	51.5	14.5	4.5	1.795	.073
	R midtemporal	54.0	12.0	2.0	2.268	.024
	R parietal	53.0	13.0	3.0	2.079	.042
	R occipital	54.0	12.0	2.0	2.268	.024
Mirror	Vertex	47.0	19.0	9.0	.945	.412
	R midtemporal	54.0	12.0	2.0	2.268	.024
	R parietal	53.0	13.0	3.0	2.079	.042
4 Hz	Vertex	49.0	17.0	7.0	1.323	.230
	R midtemporal	54.0	12.0	2.0	2.268	.024
14 Hz	Vertex	53.0	13.0	3.0	2.079	.042
	R frontal	53.0	13.0	3.0	2.079	.042
	R midtemporal	55.0	11.0	1.0	2.457	.012
	R parietal	54.0	12.0	2.0	2.268	.024
	R occipital	53.0	13.0	3.0	2.079	.042
Hyperven-tilation	Vertex	51.0	15.0	5.0	1.701	.109
	R-midtemporal	53.0	13.0	3.0	2.079	.042
	R parietal	54.0	12.0	2.0	2.268	.024

\* The table contains differences at each condition, for the vertex electrode every time, and for the other electrodes only where the differences were significant.



**Table 9.1.2** Summary of SSD scores and confidence intervals*Total population (n=11)*

<i>Subscale</i>	<i>Mean score</i>	<i>95% confidence interval - lower</i>	<i>95% confidence interval - upper</i>
Derealisation	1.06	.28	1.84
Depersonalisation	1.03	.11	1.95
Identity confusion	1.08	.14	2.02
Identity alteration	.76	.04	1.49
Conversion	.82	.19	1.45
Amnesia	.67	.02	1.32
Hypermnesia	1.25	.09	2.41
SSD (=SSD1)	.97	.21	1.73
SSD 2	1.29	.19	2.39
SSD 3	1.26	.06	2.46
SSD 4	.88	.14	1.63
SSD 5	1.55	.59	2.51

*Right-sided epileptic focus (n=7)*

<i>Subscale</i>	<i>Mean score</i>	<i>95% confidence interval - lower</i>	<i>95% confidence interval - upper</i>
Derealisation	.91	0.00	1.85
Depersonalisation	1.07	0.00	2.40
Identity confusion	1.04	0.00	2.16
Identity alteration	.91	0.00	1.99
Conversion	.79	0.00	1.67
Amnesia	.50	.11	.89
Hypermnesia	1.81	.09	3.54
SSD (=SSD1)	1.05	0.00	2.13
SSD 2	1.63	0.00	3.30
SSD 3	1.71	0.00	3.51
SSD 4	1.13	0.00	2.27
SSD 5	1.97	.60	3.34

*Left-sided epileptic focus (n=4)*

<i>Subscale</i>	<i>Mean score</i>	<i>95% confidence interval - lower</i>	<i>95% confidence interval - upper</i>
Derealisation	1.31	0.00	2.84
Depersonalisation	.97	0.00	2.24
Identity confusion	1.16	0.00	3.12
Identity alteration	.50	0.00	1.26
Conversion	.88	0.00	1.84
Amnesia	.96	0.00	2.72
Hypermnesia	.28	0.00	.61
SSD (=SSD1)	.84	0.00	1.96
SSD 2	.69	0.00	1.53
SSD 3	.46	0.00	1.05
SSD 4	.44	0.00	.93
SSD 5	.82	0.00	1.82

**Table 9.1.3** Summary of DES scores and confidence intervals

*Total population (n=11)*

<i>Subscale</i>	<i>Mean score</i>	<i>95% confidence interval - lower</i>	<i>95% confidence interval - upper</i>
DES amnestic dissociation	5.00	3.04	6.96
DES depersonalisation / derealisation	2.00	.04	3.96
DES absorption / imaginative involvement	13.00	9.08	16.92
DES (total scale)	9.00	7.04	10.96

*Right-sided epileptic focus (n=7)*

<i>Subscale</i>	<i>Mean score</i>	<i>95% confidence interval - lower</i>	<i>95% confidence interval - upper</i>
DES amnestic dissociation	6.00	4.04	7.96
DES depersonalisation / derealisation	2.00	.04	3.96
DES absorption / imaginative involvement	13.00	9.08	16.92
DES (total scale)	9.00	7.04	10.96

*Left-sided epileptic focus (n=4)*

<i>Subscale</i>	<i>Mean score</i>	<i>95% confidence interval - lower</i>	<i>95% confidence interval - upper</i>
DES amnestic dissociation	5.00	1.08	8.92
DES depersonalisation / derealisation	3.00	0.00	6.92
DES absorption / imaginative involvement	13.00	5.16	20.84
DES (total scale)	8.00	4.08	11.92



**Table 9.2.1** SSD - EEG correlation coefficients (Spearman's rho)

*Baseline measurement / EEG with eyes open (Total population, n=11)*

<i>SSD subscale score</i>	<i>Vertex <math>\delta</math></i>	<i>Vertex <math>\theta</math></i>	<i>Vertex <math>\alpha</math></i>	<i>Vertex <math>\beta</math></i>	<i>Right <math>\theta</math></i>	<i>Left <math>\theta</math></i>
Derealisation	.07	.11	.00	.34	.21	.08
Depersonalisation	.15	.11	-.21	.14	.12	.06
Identity confusion	.21	.13	-.19	.08	.13	.07
Identity alteration	.23	.22	-.11	.17	.25	.17
Conversion	.02	.15	.04	.31	.19	.23
Amnesia	.11	.09	-.10	.10	.17	.01
Hypermnesia	.30	.29	.28	.37	.39	.22
Total SSD	.36	.35	.07	.23	.38	.26

No coefficient significant at the .05 level (2-tailed)

**Table 9.2.2** SSD - EEG correlation coefficients (Spearman's rho)

*Baseline measurement / EEG with eyes open (Right-sided epileptic focus, n=7)*

<i>SSD subscale score</i>	<i>Vertex <math>\delta</math></i>	<i>Vertex <math>\theta</math></i>	<i>Vertex <math>\alpha</math></i>	<i>Vertex <math>\beta</math></i>	<i>Right <math>\theta</math></i>	<i>Left <math>\theta</math></i>
Derealisation	-.20	.15	.44	.56	.44	.44
Depersonalisation	-.08	.16	-.10	.16	.37	.37
Identity confusion	-.04	.24	.02	.20	.45	.45
Identity alteration	-.08	.16	-.10	.16	.37	.37
Conversion	-.19	.11	.07	.19	.33	.33
Amnesia	-.15	.17	.06	.11	.36	.36
Hypermnesia	.13	-.02	.44	.45	.22	.22
Total SSD	.18	.21	.04	.04	.36	.36

No coefficient significant at the .05 level (2-tailed)

**Table 9.2.3** SSD - EEG correlation coefficients (Spearman's rho)

*Baseline measurement / EEG with eyes open (Left-sided epileptic focus, n=4)*

<i>SSD subscale score</i>	<i>Vertex <math>\delta</math></i>	<i>Vertex <math>\theta</math></i>	<i>Vertex <math>\alpha</math></i>	<i>Vertex <math>\beta</math></i>	<i>Right <math>\theta</math></i>	<i>Left <math>\theta</math></i>
Derealisation	.32	-.11	-.11	0.00	-.11	-.11
Depersonalisation	.32	-.11	-.11	0.00	-.11	-.11
Identity confusion	.32	-.11	-.11	0.00	-.11	-.11
Identity alteration	.32	-.11	-.11	0.00	-.11	-.11
Conversion	.20	.20	.20	.32	.20	.20
Amnesia	.32	-.11	-.11	0.00	-.11	-.11
Hypermnesia	-.32	.11	.11	0.00	.11	.11
Total SSD	.20	.20	.20	.32	.20	.20

No coefficient significant at the .05 level (2-tailed)

**Table 9.2.4** SSD - EEG correlation coefficients (Spearman's rho)

*Baseline measurement / EEG with eyes closed (Total population, n=10)*

<i>SSD subscale score</i>	<i>Vertex <math>\delta</math></i>	<i>Vertex <math>\theta</math></i>	<i>Vertex <math>\alpha</math></i>	<i>Vertex <math>\beta</math></i>	<i>Right <math>\theta</math></i>	<i>Left <math>\theta</math></i>
Derealisation	.07	.07	-.11	-.05	.01	-.07
Depersonalisation	.25	.23	-.07	.05	.03	.03
Identity confusion	.21	.15	-.15	.07	.02	-.03
Identity alteration	.29	.30	-.07	.15	.15	.10
Conversion	.20	.22	.01	.04	.19	.13
Amnesia	.04	.01	-.40	-.10	-.08	-.19
Hypermnesia	0.00	.15	.15	.02	.18	.08
Total SSD	.26	.33	-.03	.05	.20	.12

No coefficient significant at the .05 level (2-tailed)

**Table 9.2.5** SSD - EEG correlation coefficients (Spearman's rho)

*Baseline measurement / EEG with eyes closed (Right-sided epileptic focus, n=6)*

<i>SSD subscale score</i>	<i>Vertex <math>\delta</math></i>	<i>Vertex <math>\theta</math></i>	<i>Vertex <math>\alpha</math></i>	<i>Vertex <math>\beta</math></i>	<i>Right <math>\theta</math></i>	<i>Left <math>\theta</math></i>
Derealisation	.03	.03	-.03	.29	.29	.14
Depersonalisation	.33	.33	-.03	.33	.33	.27
Identity confusion	.21	.21	.09	.39	.39	.21
Identity alteration	.33	.33	-.03	.33	.33	.27
Conversion	.03	.03	-.14	.20	.20	0.00
Amnesia	0.00	0.00	-.18	.18	.18	-.09
Hypermnesia	.09	.09	.09	.32	.32	.32
Total SSD	.26	.26	-.20	.26	.26	.14

No coefficient significant at the .05 level (2-tailed)

**Table 9.2.6** SSD - EEG correlation coefficients (Spearman's rho)

*Baseline measurement / EEG with eyes closed (Left-sided epileptic focus, n=4)*

<i>SSD subscale score</i>	<i>Vertex <math>\delta</math></i>	<i>Vertex <math>\theta</math></i>	<i>Vertex <math>\alpha</math></i>	<i>Vertex <math>\beta</math></i>	<i>Right <math>\theta</math></i>	<i>Left <math>\theta</math></i>
Derealisation	-.21	-.11	-.32	-.74	-.11	-.11
Depersonalisation	-.21	-.11	-.32	-.74	-.11	-.11
Identity confusion	-.21	-.11	-.32	-.74	-.11	-.11
Identity alteration	-.21	-.11	-.32	-.74	-.11	-.11
Conversion	0.00	.20	-.20	-.80	.20	.20
Amnesia	-.21	-.11	-.32	-.74	-.11	-.11
Hypermnesia	-.63	.11	.32	-.95	.11	.11
Total SSD	0.00	.20	-.20	-.80	.20	.20

No coefficient significant at the .05 level (2-tailed)



**Table 9.2.7** SSD - EEG correlation coefficients (Spearman's rho)

*Mirror staring (Total population, n=11)*

<i>SSD subscale score</i>	<i>Vertex <math>\delta</math></i>	<i>Vertex <math>\theta</math></i>	<i>Vertex <math>\alpha</math></i>	<i>Vertex <math>\beta</math></i>	<i>Right <math>\theta</math></i>	<i>Left <math>\theta</math></i>
Derealisation	-.40	-.03	-.16	.29	.17	.02
Depersonalisation	-.39	-.07	-.16	.26	.03	.03
Identity confusion	-.32	0.00	-.27	.22	.09	.06
Identity alteration	-.42	.03	-.11	.32	.20	.12
Conversion	-.56	-.17	-.31	.03	-.17	-.10
Amnesia	-.19	.21	-.11	.32	.25	.22
Hypermnesia	-.48	-.18	.00	-.15	.10	-.20
Total SSD	-.29	.10	-.22	.06	.14	.06

No coefficient significant at the .05 level (2-tailed)

**Table 9.2.8** SSD - EEG correlation coefficients (Spearman's rho)

*Mirror staring (Right-sided epileptic focus, n=7)*

<i>SSD subscale score</i>	<i>Vertex <math>\delta</math></i>	<i>Vertex <math>\theta</math></i>	<i>Vertex <math>\alpha</math></i>	<i>Vertex <math>\beta</math></i>	<i>Right <math>\theta</math></i>	<i>Left <math>\theta</math></i>
Derealisation	-.45	.04	-.02	.63	.41	.23
Depersonalisation	-.50	-.07	-.45	.23	-.05	.09
Identity confusion	-.41	.07	-.26	.44	.26	.22
Identity alteration	-.58	-.16	-.45	.20	.02	-.02
Conversion	-.54	-.18	-.41	.13	-.20	-.02
Amnesia	-.19	.30	-.04	.63	.52	.48
Hypermnesia	-.50	-.41	0.00	-.11	0.00	-.33
Total SSD	-.16	.21	-.21	.21	.32	.32

No coefficient significant at the .05 level (2-tailed)

**Table 9.2.9** SSD - EEG correlation coefficients (Spearman's rho)

*Mirror staring (Left-sided epileptic focus, n=4)*

<i>SSD subscale score</i>	<i>Vertex <math>\delta</math></i>	<i>Vertex <math>\theta</math></i>	<i>Vertex <math>\alpha</math></i>	<i>Vertex <math>\beta</math></i>	<i>Right <math>\theta</math></i>	<i>Left <math>\theta</math></i>
Derealisation	-.80	-.20	-.40	-.40	-.20	-.20
Depersonalisation	-.11	-.21	.11	.11	-.21	-.21
Identity confusion	-.80	-.20	-.40	-.40	-.20	-.20
Identity alteration	-.26	.26	.26	.26	.26	.26
Conversion	-.80	-.20	-.40	-.40	-.20	-.20
Amnesia	-.74	.11	-.21	-.21	.11	.11
Hypermnesia	-.77	-.26	-.77	-.77	-.26	-.26
Total SSD	-.80	-.20	-.40	-.40	-.20	-.20

No coefficient significant at the .05 level (2-tailed)

**Table 9.2.10** SSD - EEG correlation coefficients (Spearman's rho)

*Photostimulation at 4Hz (Total population, n=11)*

<i>SSD subscale score</i>	<i>Vertex <math>\delta</math></i>	<i>Vertex <math>\theta</math></i>	<i>Vertex <math>\alpha</math></i>	<i>Vertex <math>\beta</math></i>	<i>Right <math>\theta</math></i>	<i>Left <math>\theta</math></i>
Derealisation	.17	*.61	.43	** .76	*.66	.52
Depersonalisation	-.42	.09	.23	.55	.12	0.00
Identity confusion	.05	.50	.25	** .74	.48	.32
Identity alteration	-.46	.13	.36	.41	.24	.21
Conversion	-.28	.17	.17	.56	.14	.03
Amnesia	.19	.50	.05	.57	.37	.20
Hypermnesia	.13	.35	.15	.09	.42	.33
Total SSD	-.06	.29	.06	.36	.22	.10

\*\* . Significant at the .01 level (2-tailed); \* . Significant at the .05 level (2-tailed)

**Table 9.2.11** SSD - EEG correlation coefficients (Spearman's rho)

*Photostimulation at 4Hz (Right-sided epileptic focus, n=7)*

<i>SSD subscale score</i>	<i>Vertex <math>\delta</math></i>	<i>Vertex <math>\theta</math></i>	<i>Vertex <math>\alpha</math></i>	<i>Vertex <math>\beta</math></i>	<i>Right <math>\theta</math></i>	<i>Left <math>\theta</math></i>
Derealisation	.15	.30	.56	*.85	.63	.33
Depersonalisation	-.41	-.26	.11	.30	-.04	-.33
Identity confusion	.11	.33	.37	.74	.56	.30
Identity alteration	-.44	-.30	.04	.26	-.15	-.37
Conversion	-.38	-.20	.18	.43	0.00	-.23
Amnesia	.19	.48	.30	.70	.63	.41
Hypermnesia	.16	-.04	.06	.20	.22	-.04
Total SSD	-.14	-.21	-.07	.11	0.00	-.25

\* . Significant at the .05 level (2-tailed)

**Table 9.2.12** SSD - EEG correlation coefficients (Spearman's rho)

*Photostimulation at 4Hz (Left-sided epileptic focus, n=4)*

<i>SSD subscale score</i>	<i>Vertex <math>\delta</math></i>	<i>Vertex <math>\theta</math></i>	<i>Vertex <math>\alpha</math></i>	<i>Vertex <math>\beta</math></i>	<i>Right <math>\theta</math></i>	<i>Left <math>\theta</math></i>
Derealisation	.63	.95	-.11	.21	.63	.11
Depersonalisation	-.26	.26	.26	.77	-.26	-.26
Identity confusion	.21	.74	.11	.63	.21	-.11
Identity alteration	-	-	-	-	-	-
Conversion	.21	.74	.11	.63	.21	-.11
Amnesia	.21	.74	.11	.63	.21	-.11
Hypermnesia	.77	.77	-.26	-.26	.77	.26
Total SSD	.21	.74	.11	.63	.21	-.11

No coefficient significant at the .05 level (2-tailed)



**Table 9.2.13** SSD - EEG correlation coefficients (Spearman's rho)

*Photostimulation at 14Hz (Total population, n=11)*

<i>SSD subscale score</i>	<i>Vertex <math>\delta</math></i>	<i>Vertex <math>\theta</math></i>	<i>Vertex <math>\alpha</math></i>	<i>Vertex <math>\beta</math></i>	<i>Right <math>\theta</math></i>	<i>Left <math>\theta</math></i>
Derealisation	-.17	.15	.43	.42	.26	.25
Depersonalisation	-.13	.13	.16	.48	.15	.15
Identity confusion	-.08	.23	.27	.37	.31	.26
Identity alteration	-.29	.25	.43	.35	.40	.47
Conversion	-.08	.15	.30	.54	.19	.17
Amnesia	.36	.49	.17	.44	.44	.37
Hypermnesia	.22	.51	.19	.11	.52	.39
Total SSD	.05	.28	.24	.40	.28	.21

No coefficient significant at the .05 level (2-tailed)

**Table 9.2.14** SSD - EEG correlation coefficients (Spearman's rho)

*Photostimulation at 14Hz (Right-sided epileptic focus, n=7)*

<i>SSD subscale score</i>	<i>Vertex <math>\delta</math></i>	<i>Vertex <math>\theta</math></i>	<i>Vertex <math>\alpha</math></i>	<i>Vertex <math>\beta</math></i>	<i>Right <math>\theta</math></i>	<i>Left <math>\theta</math></i>
Derealisation	-.36	-.34	.43	.29	.02	.14
Depersonalisation	-.26	-.19	.26	.33	.19	.22
Identity confusion	-.26	-.19	.26	.33	.19	.22
Identity alteration	-.26	-.22	.04	.11	-.04	.15
Conversion	-.29	-.23	.50	.43	.20	.25
Amnesia	.22	.45	.34	.67	.73	.73
Hypermnesia	.15	.07	0.00	.15	.26	.19
Total SSD	-.25	-.25	.25	.18	.07	.14

No coefficient significant at the .05 level (2-tailed)

**Table 9.2.15** SSD - EEG correlation coefficients (Spearman's rho)

*Photostimulation at 14Hz (Left-sided epileptic focus, n=4)*

<i>SSD subscale score</i>	<i>Vertex <math>\delta</math></i>	<i>Vertex <math>\theta</math></i>	<i>Vertex <math>\alpha</math></i>	<i>Vertex <math>\beta</math></i>	<i>Right <math>\theta</math></i>	<i>Left <math>\theta</math></i>
Derealisation	.95	.95	.11	.21	.63	.11
Depersonalisation	.74	.74	-.11	.63	.21	-.11
Identity confusion	.95	.95	.11	.21	.63	.11
Identity alteration	-	-	-	-	-	-
Conversion	.74	.74	-.11	.63	.21	-.11
Amnesia	.95	.95	.11	.21	.63	.11
Hypermnesia	.77	.77	.26	-.26	.77	.26
Total SSD	.74	.74	-.11	.63	.21	-.11

No coefficient significant at the .05 level (2-tailed)

**Table 9.2.16** SSD - EEG correlation coefficients (Spearman's rho)

*Hyperventilation (Total population, n=11)*

<i>SSD subscale score</i>	<i>Vertex <math>\delta</math></i>	<i>Vertex <math>\theta</math></i>	<i>Vertex <math>\alpha</math></i>	<i>Vertex <math>\beta</math></i>	<i>Right <math>\theta</math></i>	<i>Left <math>\theta</math></i>
Derealisation	.18	.11	.42	.31	.23	.33
Depersonalisation	.43	.23	.37	.57	.42	.45
Identity confusion	.26	.20	.47	.22	.21	.34
Identity alteration	.44	.48	.53	.29	*.66	** .72
Conversion	.14	.10	.30	.01	.22	.29
Amnesia	.22	.23	.50	.20	.24	.37
Hypermnesia	.25	.44	-.20	-.16	.50	.36
Total SSD	.38	.32	.29	.16	.41	.49

\*\* . Significant at the .01 level (2-tailed); \* . Significant at the .05 level (2-tailed)

**Table 9.2.17** SSD - EEG correlation coefficients (Spearman's rho)

*Hyperventilation (Right-sided epileptic focus, n=7)*

<i>SSD subscale score</i>	<i>Vertex <math>\delta</math></i>	<i>Vertex <math>\theta</math></i>	<i>Vertex <math>\alpha</math></i>	<i>Vertex <math>\beta</math></i>	<i>Right <math>\theta</math></i>	<i>Left <math>\theta</math></i>
Derealisation	-.04	.07	.36	.57	.39	.50
Depersonalisation	.25	.29	.50	.71	.57	.64
Identity confusion	.19	.15	.26	.48	.41	.48
Identity alteration	.25	.22	.50	.54	.41	.54
Conversion	-.23	-.13	.07	.20	.14	.31
Amnesia	.15	.19	.30	.56	.48	.56
Hypermnesia	-.04	.05	-.45	.11	.29	.22
Total SSD	.11	.18	.11	.43	.46	.57

No coefficient significant at the .05 level (2-tailed)

**Table 9.2.18** SSD - EEG correlation coefficients (Spearman's rho)

*Hyperventilation (Left-sided epileptic focus, n=4)*

<i>SSD subscale score</i>	<i>Vertex <math>\delta</math></i>	<i>Vertex <math>\theta</math></i>	<i>Vertex <math>\alpha</math></i>	<i>Vertex <math>\beta</math></i>	<i>Right <math>\theta</math></i>	<i>Left <math>\theta</math></i>
Derealisation	.40	-.40	.60	0.00	-.40	-.40
Depersonalisation	.95	-.74	-.21	.74	-.74	-.74
Identity confusion	.32	-.11	.74	-.21	-.11	-.11
Identity alteration	-	-	-	-	-	-
Conversion	.40	-.40	.60	0.00	-.40	-.40
Amnesia	-.32	.11	.95	-.63	.11	.11
Hypermnesia	-.77	.26	.77	-.77	.26	.26
Total SSD	.40	-.40	.60	0.00	-.40	-.40

No coefficient significant at the .05 level (2-tailed)



**Table 9.3** Significant SSD - EEG correlation coefficients (Spearman's rho)<sup>†</sup> at each condition (n=11)

<i>SSD subscale</i>	<i>Waveband power</i>	<i>Baseline / eyes open</i>	<i>Baseline / eyes closed</i>	<i>Mirror staring</i>	<i>4 Hz photostim</i>	<i>14 Hz photostim</i>	<i>Hyperventilation</i>
<b>Total SSD score</b>	Delta	0.36					0.38
	Theta	0.35	0.33				0.32
	Alpha						
	Beta				0.36	0.40	
<b>Derealisation</b>	Delta			- 0.40			
	Theta				0.61 *		
	Alpha				0.43	0.43	0.42
	Beta	0.34			0.76 **	0.42	0.31
<b>Depersonalisation</b>	Delta			- 0.39	- 0.42		0.43
	Theta						
	Alpha						0.37
	Beta				0.55	0.48	0.57
<b>Identity confusion</b>	Delta			- 0.32			
	Theta				0.50		
	Alpha						0.47
	Beta				0.74 **	0.37	
<b>Identity alteration</b>	Delta			- 0.42	- 0.46		0.44
	Theta		0.30		0.36		0.48 †
	Alpha					0.43	0.53
	Beta			0.32	0.41	0.35	
<b>Conversion</b>	Delta			- 0.56			
	Theta						
	Alpha			- 0.31		0.30	0.30
	Beta	0.31			0.56	0.54	
<b>Amnesia</b>	Delta					0.36	
	Theta				0.50	0.49	
	Alpha		- 0.40				0.50
	Beta			0.32	0.57	0.44	
<b>Hypermnnesia</b>	Delta	0.30		- 0.48			
	Theta				0.35	0.51	0.44
	Alpha						
	Beta	0.37					

† Correlation coefficients ≥ 0.30 were included in this table

\* Significant at the 0.05 level

\*\* Significant at the 0.01 level

‡ Significant when correlated separately with right-sided and left-sided theta power (Table 9.2.16)

**Table 9.4.1** Canonical analysis: *SSD / vertex delta during mirror staring*

<i>n=11</i>	<i>Canonical R</i>	<i>Canonical R-square</i>	<i>Chi- square</i>	<i>df</i>	<i>p</i>	<i>Lambda prime</i>	<i>Redundancy of root 1 (subscale)</i>	<i>Redundancy of root 1 (delta)</i>
Der	.797	.635	7.975	4	.093	.345	.498	.098
Dep	.820	.672	8.427	4	.077	.325	.642	.137
Idc	.908	.825	13.161	4	.011	.173	.501	.127
Ida	.905	.819	12.915	4	.012	.179	.751	.136
Con	.896	.803	12.212	4	.016	.196	.630	.184
Amn	.430	.185	1.698	4	.791	.797	.077	.019
Hyp	.946	.895	16.895	4	.002	.105	.831	.101
SSD	.880	.775	11.297	4	.023	.222	.687	.123

**Table 9.4.2** Canonical analysis: *SSD / vertex delta during photostimulation @ 4 Hz*

<i>n=11</i>	<i>Canonical R</i>	<i>Canonical R-square</i>	<i>Chi- square</i>	<i>df</i>	<i>p</i>	<i>Lambda prime</i>	<i>Redundancy of root 1 (subscale)</i>	<i>Redundancy of root 1 (delta)</i>
Der	.706	.499	5.429	4	.246	.485	.222	.039
Dep	.711	.506	5.304	4	.258	.493	.349	.095
Idc	.550	.302	2.776	4	.596	.691	.253	.045
Ida	.700	.491	5.059	4	.281	.509	.419	.084
Con	.710	.504	5.260	4	.262	.496	.361	.134
Amn	.273	.075	.623	4	.960	.920	.054	.027
Hyp	.664	.441	4.453	4	.348	.553	.392	.035
SSD	.653	.426	4.209	4	.379	.571	.347	.057

**Table 9.4.3** Canonical analysis: *SSD / vertex delta during photostimulation @ 14 Hz*

<i>n=11</i>	<i>Canonical R</i>	<i>Canonical R-square</i>	<i>Chi- square</i>	<i>df</i>	<i>p</i>	<i>Lambda prime</i>	<i>Redundancy of root 1 (subscale)</i>	<i>Redundancy of root 1 (delta)</i>
Der	.250	.062	.637	4	.959	.919	.030	.037
Dep	.490	.241	2.138	4	.710	.752	.077	.038
Idc	.292	.085	.672	4	.955	.914	.064	.029
Ida	.330	.109	.866	4	.929	.891	.091	.027
Con	.307	.094	.931	4	.920	.883	.085	.058
Amn	.341	.116	1.010	4	.908	.874	.041	.030
Hyp	.503	.253	2.792	4	.593	.689	.159	.036
SSD	.296	.088	.689	4	.953	.912	.078	.022

**Table 9.4.4** Canonical analysis: *SSD / vertex delta during hyperventilation*

<i>n=10</i>	<i>Canonical R</i>	<i>Canonical R-square</i>	<i>Chi- square</i>	<i>df</i>	<i>p</i>	<i>Lambda prime</i>	<i>Redundancy of root 1 (subscale)</i>	<i>Redundancy of root 1 (delta)</i>
Der	.502	.252	1.948	4	.745	.741	.125	.044
Dep	.851	.725	8.398	4	.078	.275	.223	.165
Idc	.824	.679	7.398	4	.116	.320	.368	.149
Ida	.790	.624	6.430	4	.169	.372	.319	.153
Con	.572	.327	2.591	4	.628	.671	.128	.067
Amn	.755	.570	5.570	4	.234	.425	.322	.102
Hyp	.500	.250	1.989	4	.738	.736	.010	.044
SSD	.798	.637	6.594	4	.159	.363	.207	.133



**Table 9.4.5** Canonical analysis: *SSD / vertex theta* during mirror staring

<i>n=11</i>	<i>Canonical R</i>	<i>Canonical R-square</i>	<i>Chi- square</i>	<i>df</i>	<i>p</i>	<i>Lambda prime</i>	<i>Redundancy of root 1 (subscale)</i>	<i>Redundancy of root 1 (theta)</i>
Der	.505	.255	3.173	4	.529	.655	.157	.027
Dep	.529	.280	2.976	4	.562	.673	.258	.046
Idc	.764	.583	6.777	4	.148	.405	.149	.034
Ida	.671	.451	5.078	4	.279	.508	.334	.023
Con	.719	.516	5.590	4	.232	.475	.244	.030
Amn	.445	.198	1.665	4	.797	.801	.031	.092
Hyp	.698	.488	5.052	4	.282	.510	.421	.022
SSD	.620	.384	4.268	4	.371	.566	.245	.025

**Table 9.4.6** Canonical analysis: *SSD / vertex theta* during photostimulation @ 4 Hz

<i>n=11</i>	<i>Canonical R</i>	<i>Canonical R-square</i>	<i>Chi- square</i>	<i>df</i>	<i>p</i>	<i>Lambda prime</i>	<i>Redundancy of root 1 (subscale)</i>	<i>Redundancy of root 1 (theta)</i>
Der	.498	.248	2.188	4	.701	.747	.043	.076
Dep	.275	.076	.590	4	.964	.924	.010	.012
Idc	.442	.195	1.815	4	.770	.785	.035	.058
Ida	.473	.224	1.917	4	.751	.775	.013	.025
Con	.452	.204	1.719	4	.787	.795	.018	.015
Amn	.432	.186	1.841	4	.765	.782	.103	.025
Hyp	.192	.037	.462	4	.977	.940	.007	.003
SSD	.463	.214	1.845	4	.764	.782	.012	.047

**Table 9.4.7** Canonical analysis: *SSD / vertex theta* during photostimulation @ 14 Hz

<i>n=11</i>	<i>Canonical R</i>	<i>Canonical R-square</i>	<i>Chi- square</i>	<i>df</i>	<i>p</i>	<i>Lambda prime</i>	<i>Redundancy of root 1 (subscale)</i>	<i>Redundancy of root 1 (theta)</i>
Der	.122	.015	.137	4	.998	.982	.010	.009
Dep	.107	.011	.086	4	.999	.989	.005	.011
Idc	.208	.043	.387	4	.984	.950	.011	.008
Ida	.103	.011	.122	4	.998	.984	.007	.003
Con	.385	.149	1.310	4	.860	.840	.016	.005
Amn	.402	.161	1.326	4	.857	.838	.055	.051
Hyp	.443	.196	1.643	4	.801	.803	.169	.011
SSD	.127	.016	.141	4	.998	.981	.013	.004

**Table 9.4.8** Canonical analysis: *SSD / vertex theta* during hyperventilation

<i>n=10</i>	<i>Canonical R</i>	<i>Canonical R-square</i>	<i>Chi- square</i>	<i>df</i>	<i>p</i>	<i>Lambda prime</i>	<i>Redundancy of root 1 (subscale)</i>	<i>Redundancy of root 1 (theta)</i>
Der	.556	.309	2.452	4	.653	.686	.205	.029
Dep	.876	.768	9.576	4	.048	.229	.302	.116
Idc	.824	.679	7.498	4	.112	.316	.414	.084
Ida	.783	.613	6.210	4	.184	.385	.325	.096
Con	.628	.394	3.283	4	.512	.603	.270	.037
Amn	.917	.840	12.283	4	.015	.151	.454	.111
Hyp	.705	.497	4.473	4	.346	.503	.124	.079
SSD	.860	.740	8.823	4	.066	.257	.350	.103

**Table 9.4.9** Canonical analysis: *SSD / vertex alpha during mirror staring*

<i>n=11</i>	<i>Canonical R</i>	<i>Canonical R-square</i>	<i>Chi- square</i>	<i>df</i>	<i>p</i>	<i>Lambda prime</i>	<i>Redundancy of root 1 (subscale)</i>	<i>Redundancy of root 1 (alpha)</i>
Der	.306	.094	1.031	4	.905	.872	.007	.083
Dep	.642	.412	4.105	4	.392	.579	.016	.185
Idc	.476	.227	1.930	4	.749	.773	.049	.056
Ida	.358	.128	1.050	4	.902	.869	.014	.122
Con	.528	.279	2.517	4	.642	.715	.037	.015
Amn	.449	.202	2.397	4	.663	.726	.129	.017
Hyp	.564	.318	2.880	4	.578	.681	.010	.025
SSD	.347	.120	1.094	4	.895	.864	.007	.115

**Table 9.4.10** Canonical analysis: *SSD / vertex alpha during photostimulation @ 4 Hz*

<i>n=11</i>	<i>Canonical R</i>	<i>Canonical R-square</i>	<i>Chi- square</i>	<i>df</i>	<i>p</i>	<i>Lambda prime</i>	<i>Redundancy of root 1 (subscale)</i>	<i>Redundancy of root 1 (alpha)</i>
Der	.753	.566	7.163	4	.128	.385	.463	.008
Dep	.795	.632	7.936	4	.094	.347	.598	.009
Idc	.760	.578	7.350	4	.119	.375	.441	.016
Ida	.760	.577	7.011	4	.135	.393	.511	.011
Con	.825	.680	8.774	4	.067	.310	.626	.009
Amn	.643	.413	4.342	4	.362	.561	.288	.022
Hyp	.666	.443	4.397	4	.355	.556	.290	.019
SSD	.774	.599	7.613	4	.107	.362	.529	.012

**Table 9.4.11** Canonical analysis: *SSD / vertex alpha during photostimulation: 14 Hz*

<i>n=11</i>	<i>Canonical R</i>	<i>Canonical R-square</i>	<i>Chi- square</i>	<i>df</i>	<i>p</i>	<i>Lambda prime</i>	<i>Redundancy of root 1 (subscale)</i>	<i>Redundancy of root 1 (alpha)</i>
Der	.803	.645	7.887	4	.096	.349	.389	.017
Dep	.622	.387	3.804	4	.433	.602	.323	.011
Idc	.617	.381	3.762	4	.439	.606	.263	.010
Ida	.625	.390	3.720	4	.445	.609	.344	.011
Con	.850	.722	9.620	4	.047	.277	.389	.026
Amn	.330	.109	1.030	4	.905	.872	.073	.040
Hyp	.381	.145	1.590	4	.811	.809	.138	.006
SSD	.663	.439	4.370	4	.358	.558	.311	.012

**Table 9.4.12** Canonical analysis: *SSD / vertex alpha during hyperventilation*

<i>n=10</i>	<i>Canonical R</i>	<i>Canonical R-square</i>	<i>Chi- square</i>	<i>df</i>	<i>p</i>	<i>Lambda prime</i>	<i>Redundancy of root 1 (subscale)</i>	<i>Redundancy of root 1 (alpha)</i>
Der	.452	.204	1.485	4	.829	.796	.125	.026
Dep	.740	.548	5.380	4	.251	.437	.143	.059
Idc	.590	.348	2.847	4	.584	.645	.237	.045
Ida	.495	.245	2.052	4	.726	.729	.120	.024
Con	.704	.495	4.588	4	.332	.494	.184	.064
Amn	.700	.490	5.322	4	.256	.441	.314	.050
Hyp	.829	.687	7.565	4	.109	.312	.011	.158
SSD	.566	.321	2.628	4	.622	.668	.122	.034



**Table 9.4.13** Canonical analysis: *SSD / vertex beta during mirror staring*

<i>n=11</i>	<i>Canonical R</i>	<i>Canonical R-square</i>	<i>Chi- square</i>	<i>df</i>	<i>p</i>	<i>Lambda prime</i>	<i>Redundancy of root 1 (subscale)</i>	<i>Redundancy of root 1 (beta)</i>
Der	.573	.329	3.715	4	.446	.609	.232	.156
Dep	.634	.402	6.042	4	.196	.447	.379	.074
Idc	.838	.702	9.073	4	.059	.298	.257	.133
Ida	.730	.532	6.258	4	.181	.434	.433	.100
Con	.795	.632	7.536	4	.110	.366	.364	.054
Amn	.457	.209	1.795	4	.773	.787	.039	.195
Hyp	.817	.668	8.692	4	.069	.314	.556	.070
SSD	.716	.513	5.976	4	.201	.451	.368	.168

**Table 9.4.14** Canonical analysis: *SSD / vertex beta during photostimulation @ 4 Hz*

<i>n=11</i>	<i>Canonical R</i>	<i>Canonical R-square</i>	<i>Chi- square</i>	<i>df</i>	<i>p</i>	<i>Lambda prime</i>	<i>Redundancy of root 1 (subscale)</i>	<i>Redundancy of root 1 (beta)</i>
Der	.568	.322	4.252	4	.373	.567	.150	.303
Dep	.545	.297	4.498	4	.343	.549	.087	.014
Idc	.811	.658	10.091	4	.039	.260	.102	.105
Ida	.791	.626	8.944	4	.063	.304	.067	.039
Con	.456	.207	2.333	4	.675	.733	.194	.132
Amn	.805	.648	8.820	4	.066	.309	.209	.066
Hyp	.553	.306	4.153	4	.386	.575	.014	.009
SSD	.744	.554	7.849	4	.097	.351	.030	.111

**Table 9.4.15** Canonical analysis: *SSD / vertex beta during photostimulation: 14 Hz*

<i>n=11</i>	<i>Canonical R</i>	<i>Canonical R-square</i>	<i>Chi- square</i>	<i>df</i>	<i>p</i>	<i>Lambda prime</i>	<i>Redundancy of root 1 (subscale)</i>	<i>Redundancy of root 1 (beta)</i>
Der	.250	.062	.535	4	.970	.931	.047	.050
Dep	.280	.079	.835	4	.934	.895	.065	.039
Idc	.257	.066	.773	4	.942	.902	.050	.054
Ida	.303	.092	1.034	4	.905	.871	.032	.084
Con	.394	.155	1.649	4	.800	.803	.016	.026
Amn	.380	.144	1.252	4	.870	.846	.066	.007
Hyp	.688	.473	4.807	4	.308	.527	.163	.215
SSD	.274	.075	.649	4	.957	.917	.054	.070

**Table 9.4.16** Canonical analysis: *SSD / vertex beta during hyperventilation*

<i>n=10</i>	<i>Canonical R</i>	<i>Canonical R-square</i>	<i>Chi- square</i>	<i>df</i>	<i>p</i>	<i>Lambda prime</i>	<i>Redundancy of root 1 (subscale)</i>	<i>Redundancy of root 1 (beta)</i>
Der	.212	.045	.369	4	.985	.945	.022	.012
Dep	.540	.292	2.246	4	.691	.708	.065	.126
Idc	.410	.168	1.200	4	.878	.832	.095	.041
Ida	.366	.134	.935	4	.920	.866	.063	.040
Con	.377	.142	1.004	4	.909	.857	.049	.040
Amn	.482	.232	2.139	4	.710	.720	.125	.084
Hyp	.451	.203	1.626	4	.804	.779	.006	.102
SSD	.428	.183	1.314	4	.859	.817	.047	.067

**Table 9.5.1** Canonical analysis: *Mirror / vertex electrode*

<i>(n=11)</i> <i>SSD subscale score</i>	<i>Delta:</i> <i>Canonical R (p)</i>	<i>Theta:</i> <i>Canonical R (p)</i>	<i>Alpha:</i> <i>Canonical R (p)</i>	<i>Beta:</i> <i>Canonical R (p)</i>
Derealisation	.80 (.09)	.51 (.53)	.31 (.91)	.57 (.45)
Depersonalisation	.82 (.08)	.53 (.56)	.64 (.39)	.63 (.20)
Identity confusion	.91 (.01)	.76 (.15)	.48 (.75)	.84 (.06)
Identity alteration	.91 (.01)	.67 (.28)	.36 (.90)	.73 (.18)
Conversion	.90 (.02)	.72 (.23)	.53 (.64)	.80 (.11)
Amnesia	.43 (.79)	.45 (.80)	.45 (.66)	.46 (.77)
Hypermnesia	.95 (.002)	.70 (.28)	.56 (.58)	.82 (.07)
Total SSD	.88 (.02)	.62 (.37)	.35 (.90)	.72 (.20)

**Table 9.5.2** Canonical analysis: *4 Hz / vertex electrode*

<i>(n=11)</i> <i>SSD subscale score</i>	<i>Delta:</i> <i>Canonical R (p)</i>	<i>Theta:</i> <i>Canonical R (p)</i>	<i>Alpha:</i> <i>Canonical R (p)</i>	<i>Beta:</i> <i>Canonical R (p)</i>
Derealisation	.71 (.25)	.50 (.70)	.75 (.13)	.57 (.37)
Depersonalisation	.71 (.26)	.28 (.96)	.80 (.09)	.55 (.34)
Identity confusion	.55 (.60)	.44 (.77)	.76 (.12)	.81 (.04)
Identity alteration	.70 (.28)	.47 (.75)	.76 (.14)	.79 (.06)
Conversion	.71 (.26)	.45 (.79)	.83 (.07)	.46 (.68)
Amnesia	.27 (.96)	.43 (.77)	.64 (.36)	.81 (.07)
Hypermnesia	.66 (.35)	.19 (.98)	.67 (.36)	.55 (.39)
Total SSD	.65 (.38)	.46 (.76)	.77 (.11)	.74 (.10)

**Table 9.5.3** Canonical analysis: *14 Hz / vertex electrode*

<i>(n=11)</i> <i>SSD subscale score</i>	<i>Delta:</i> <i>Canonical R (p)</i>	<i>Theta:</i> <i>Canonical R (p)</i>	<i>Alpha:</i> <i>Canonical R (p)</i>	<i>Beta:</i> <i>Canonical R (p)</i>
Derealisation	.25 (.96)	.12 (>.99)	.80 (.10)	.25 (.97)
Depersonalisation	.49 (.71)	.11 (>.99)	.62 (.43)	.28 (.93)
Identity confusion	.29 (.96)	.21 (.98)	.62 (.44)	.26 (.94)
Identity alteration	.33 (.93)	.10 (>.99)	.63 (.45)	.30 (.91)
Conversion	.31 (.92)	.39 (.86)	.85 (.05)	.39 (.80)
Amnesia	.34 (.91)	.40 (.86)	.33 (.91)	.38 (.87)
Hypermnesia	.50 (.59)	.44 (.80)	.38 (.81)	.69 (.31)
Total SSD	.30 (.95)	.13 (>.99)	.66 (.36)	.27 (.96)

**Table 9.5.4** Canonical analysis: *Hyperventilation / vertex electrode*

<i>(n=10)</i> <i>SSD subscale score</i>	<i>Delta:</i> <i>Canonical R (p)</i>	<i>Theta:</i> <i>Canonical R (p)</i>	<i>Alpha:</i> <i>Canonical R (p)</i>	<i>Beta:</i> <i>Canonical R (p)</i>
Derealisation	.50 (.75)	.56 (.65)	.45 (.83)	.21 (.99)
Depersonalisation	.85 (.08)	.88 (.05)	.74 (.25)	.54 (.69)
Identity confusion	.82 (.12)	.82 (.11)	.59 (.58)	.41 (.88)
Identity alteration	.79 (.17)	.78 (.18)	.50 (.73)	.37 (.92)
Conversion	.57 (.63)	.63 (.51)	.70 (.33)	.38 (.91)
Amnesia	.76 (.23)	.92 (.02)	.70 (.26)	.48 (.71)
Hypermnesia	.50 (.74)	.71 (.35)	.83 (.11)	.45 (.80)
Total SSD	.80 (.16)	.86 (.07)	.57 (.62)	.43 (.86)



**Table 9.5.5** Canonical analysis: *Mirror / left mid-temporal electrode*

( <i>n</i> =11)	<i>Delta:</i>	<i>Theta:</i>	<i>Alpha:</i>	<i>Beta:</i>
<i>SSD subscale score</i>	<i>Canonical R (p)</i>	<i>Canonical R (p)</i>	<i>Canonical R (p)</i>	<i>Canonical R (p)</i>
Derealisation	.60 (.42)	.51 (.45)	.49 (.72)	.71 (.17)
Depersonalisation	.62 (.45)	.72 (.19)	.73 (.21)	.84 (.04)
Identity confusion	.64 (.34)	.77 (.13)	.69 (.30)	.84 (.04)
Identity alteration	.65 (.32)	.68 (.19)	.64 (.33)	.82 (.06)
Conversion	.70 (.28)	.75 (.18)	.51 (.69)	.82 (.07)
Amnesia	.41 (.78)	.43 (.82)	.55 (.56)	.35 (.82)
Hypermnesia	.73 (.21)	.80 (.09)	.58 (.47)	.78 (.13)
Total SSD	.65 (.36)	.55 (.39)	.64 (.40)	.76 (.11)

**Table 9.5.6** Canonical analysis: *4 Hz / left mid-temporal electrode*

( <i>n</i> =11)	<i>Delta:</i>	<i>Theta:</i>	<i>Alpha:</i>	<i>Beta:</i>
<i>SSD subscale score</i>	<i>Canonical R (p)</i>	<i>Canonical R (p)</i>	<i>Canonical R (p)</i>	<i>Canonical R (p)</i>
Derealisation	.76 (.12)	.60 (.51)	<b>.92 (.003)</b>	.75 (.15)
Depersonalisation	.71 (.25)	.41 (.80)	.85 (.04)	.77 (.13)
Identity confusion	.67 (.32)	.55 (.59)	.68 (.11)	.50 (.57)
Identity alteration	.75 (.17)	.55 (.44)	<b>.95 (.001)</b>	.82 (.08)
Conversion	.80 (.11)	.35 (.89)	.84 (.05)	.65 (.24)
Amnesia	.46 (.67)	.55 (.60)	.59 (.45)	.60 (.50)
Hypermnesia	.79 (.11)	.45 (.73)	<b>.92 (.01)</b>	<b>.84 (.02)</b>
Total SSD	.77 (.14)	.55 (.56)	<b>.83 (.02)</b>	.64 (.37)

**Table 9.5.7** Canonical analysis: *14 Hz / left mid-temporal electrode*

( <i>n</i> =11)	<i>Delta:</i>	<i>Theta:</i>	<i>Alpha:</i>	<i>Beta:</i>
<i>SSD subscale score</i>	<i>Canonical R (p)</i>	<i>Canonical R (p)</i>	<i>Canonical R (p)</i>	<i>Canonical R (p)</i>
Derealisation	.25 (.96)	.40 (.87)	.87 (.03)	.73 (.20)
Depersonalisation	.20 (.98)	.36 (.91)	.84 (.05)	.69 (.23)
Identity confusion	.42 (.81)	.52 (.67)	<b>.91 (.01)</b>	.79 (.11)
Identity alteration	.28 (.95)	.42 (.82)	.87 (.03)	.73 (.17)
Conversion	.29 (.95)	.23 (.98)	.86 (.04)	.65 (.19)
Amnesia	.39 (.88)	.43 (.76)	.55 (.44)	.39 (.88)
Hypermnesia	.53 (.41)	.59 (.52)	<b>.88 (.02)</b>	.68 (.28)
Total SSD	.33 (.89)	.47 (.76)	<b>.91 (.01)</b>	.74 (.17)

**Table 9.5.8** Canonical analysis: *Hyperventilation / left mid-temporal electrode*

( <i>n</i> =10)	<i>Delta:</i>	<i>Theta:</i>	<i>Alpha:</i>	<i>Beta:</i>
<i>SSD subscale score</i>	<i>Canonical R (p)</i>	<i>Canonical R (p)</i>	<i>Canonical R (p)</i>	<i>Canonical R (p)</i>
Derealisation	.46 (.82)	.62 (.52)	.70 (.34)	.42 (.86)
Depersonalisation	.80 (.11)	.89 (.04)	.87 (.05)	.79 (.14)
Identity confusion	.84 (.09)	.85 (.08)	.74 (.27)	.86 (.07)
Identity alteration	.82 (.09)	.84 (.09)	.66 (.45)	.84 (.08)
Conversion	.60 (.42)	.66 (.37)	.84 (.09)	.46 (.80)
Amnesia	.75 (.24)	<b>.93 (.01)</b>	.82 (.07)	.54 (.61)
Hypermnesia	.63 (.36)	.72 (.20)	.75 (.24)	.56 (.63)
Total SSD	.77 (.18)	.90 (.03)	.79 (.17)	.75 (.22)

**Table 9.5.9** Canonical analysis: *Mirror / right mid-temporal electrode*

( <i>n</i> =11)	<i>Delta:</i>	<i>Theta:</i>	<i>Alpha:</i>	<i>Beta:</i>
<i>SSD subscale score</i>	<i>Canonical R (p)</i>	<i>Canonical R (p)</i>	<i>Canonical R (p)</i>	<i>Canonical R (p)</i>
Derealisation	.83 (.07)	.83 (.05)	.83 (.05)	.66 (.32)
Depersonalisation	.84 (.05)	.76 (.04)	.85 (.01)	.83 (.04)
Identity confusion	.78 (.12)	.83 (.06)	.74 (.20)	.54 (.61)
Identity alteration	.78 (.11)	.78 (.07)	.68 (.16)	.50 (.60)
Conversion	.77 (.16)	.81 (.09)	.75 (.15)	.54 (.57)
Amnesia	.51 (.66)	.74 (.20)	.85 (.05)	.73 (.22)
Hypermnesia	.78 (.11)	.84 (.05)	.91 (.01)	.79 (.09)
Total SSD	.77 (.14)	.87 (.02)	.84 (.04)	.65 (.35)

**Table 9.5.10** Canonical analysis: *4 Hz / right mid-temporal electrode*

( <i>n</i> =11)	<i>Delta:</i>	<i>Theta:</i>	<i>Alpha:</i>	<i>Beta:</i>
<i>SSD subscale score</i>	<i>Canonical R (p)</i>	<i>Canonical R (p)</i>	<i>Canonical R (p)</i>	<i>Canonical R (p)</i>
Derealisation	.91 (.01)	.55 (.51)	.66 (.30)	.67 (.31)
Depersonalisation	.93 (.004)	.64 (.41)	.91 (.01)	.88 (.02)
Identity confusion	.89 (.01)	.78 (.13)	.96 (.001)	.91 (.01)
Identity alteration	.87 (.02)	.58 (.55)	.67 (.30)	.66 (.31)
Conversion	.86 (.04)	.33 (.85)	.59 (.50)	.51 (.67)
Amnesia	.65 (.34)	.71 (.24)	.95 (.001)	.85 (.04)
Hypermnesia	.89 (.02)	.58 (.49)	.91 (.01)	.76 (.10)
Total SSD	.92 (.01)	.65 (.36)	.83 (.06)	.78 (.13)

**Table 9.5.11** Canonical analysis: *14 Hz / right mid-temporal electrode*

( <i>n</i> =11)	<i>Delta:</i>	<i>Theta:</i>	<i>Alpha:</i>	<i>Beta:</i>
<i>SSD subscale score</i>	<i>Canonical R (p)</i>	<i>Canonical R (p)</i>	<i>Canonical R (p)</i>	<i>Canonical R (p)</i>
Derealisation	.35 (.91)	.53 (.64)	.58 (.54)	.58 (.50)
Depersonalisation	.55 (.62)	.52 (.68)	.60 (.50)	.54 (.60)
Identity confusion	.54 (.62)	.47 (.76)	.50 (.71)	.50 (.70)
Identity alteration	.53 (.63)	.64 (.42)	.74 (.21)	.74 (.21)
Conversion	.51 (.60)	.72 (.22)	.79 (.12)	.74 (.16)
Amnesia	.44 (.80)	.34 (.88)	.33 (.85)	.36 (.84)
Hypermnesia	.67 (.29)	.92 (.01)	.97 (.0002)	.96 (.001)
Total SSD	.51 (.68)	.64 (.41)	.69 (.30)	.70 (.28)

**Table 9.5.12** Canonical analysis: *Hyperventilation / right mid-temporal electrode*

( <i>n</i> =10)	<i>Delta:</i>	<i>Theta:</i>	<i>Alpha:</i>	<i>Beta:</i>
<i>SSD subscale score</i>	<i>Canonical R (p)</i>	<i>Canonical R (p)</i>	<i>Canonical R (p)</i>	<i>Canonical R (p)</i>
Derealisation	.50 (.72)	.60 (.57)	.71 (.32)	.45 (.79)
Depersonalisation	.64 (.43)	.74 (.28)	.86 (.07)	.74 (.25)
Identity confusion	.51 (.73)	.64 (.49)	.79 (.16)	.66 (.37)
Identity alteration	.47 (.70)	.54 (.69)	.69 (.35)	.59 (.53)
Conversion	.65 (.37)	.75 (.24)	.82 (.12)	.61 (.50)
Amnesia	.61 (.42)	.87 (.04)	.88 (.02)	.78 (.16)
Hypermnesia	.75 (.17)	.94 (.01)	.96 (.003)	.83 (.08)
Total SSD	.58 (.55)	.75 (.26)	.82 (.12)	.67 (.35)



**Table 9.5.13** Canonical analysis: *Mirror / left frontal electrode*

( <i>n</i> =11)	<i>Delta:</i>	<i>Theta:</i>	<i>Alpha:</i>	<i>Beta:</i>
<i>SSD subscale score</i>	<i>Canonical R (p)</i>	<i>Canonical R (p)</i>	<i>Canonical R (p)</i>	<i>Canonical R (p)</i>
Derealisation	.80 (.10)	.52 (.46)	.35 (.88)	.60 (.48)
Depersonalisation	.79 (.12)	.51 (.60)	.44 (.76)	.59 (.49)
Identity confusion	.70 (.22)	.77 (.13)	.62 (.45)	.80 (.11)
Identity alteration	.75 (.17)	.68 (.24)	.48 (.64)	.71 (.25)
Conversion	.67 (.36)	.72 (.23)	.67 (.35)	.77 (.13)
Amnesia	.48 (.54)	.42 (.83)	.22 (.98)	.32 (.94)
Hypermnesia	.80 (.10)	.75 (.19)	.66 (.36)	.71 (.26)
Total SSD	.79 (.12)	.61 (.38)	.34 (.87)	.70 (.29)

**Table 9.5.14** Canonical analysis: *4 Hz / left frontal electrode*

( <i>n</i> =11)	<i>Delta:</i>	<i>Theta:</i>	<i>Alpha:</i>	<i>Beta:</i>
<i>SSD subscale score</i>	<i>Canonical R (p)</i>	<i>Canonical R (p)</i>	<i>Canonical R (p)</i>	<i>Canonical R (p)</i>
Derealisation	.74 (.19)	.50 (.70)	.63 (.29)	.80 (.09)
Depersonalisation	.84 (.04)	.54 (.62)	.84 (.06)	.58 (.51)
Identity confusion	.70 (.28)	.49 (.72)	.68 (.29)	.60 (.46)
Identity alteration	.69 (.29)	.45 (.78)	.85 (.04)	.71 (.24)
Conversion	.60 (.50)	.09 (>.99)	.71 (.25)	.55 (.59)
Amnesia	.48 (.57)	.37 (.88)	.49 (.73)	.37 (.84)
Hypermnesia	.76 (.16)	.30 (.95)	.88 (.03)	.70 (.28)
Total SSD	.74 (.20)	.45 (.79)	.74 (.17)	.66 (.32)

**Table 9.5.15** Canonical analysis: *14 Hz / left frontal electrode*

( <i>n</i> =11)	<i>Delta:</i>	<i>Theta:</i>	<i>Alpha:</i>	<i>Beta:</i>
<i>SSD subscale score</i>	<i>Canonical R (p)</i>	<i>Canonical R (p)</i>	<i>Canonical R (p)</i>	<i>Canonical R (p)</i>
Derealisation	.39 (.82)	.38 (.81)	.84 (.05)	.48 (.70)
Depersonalisation	.53 (.46)	.33 (.89)	.70 (.26)	.49 (.68)
Identity confusion	.58 (.45)	.26 (.95)	.78 (.13)	.46 (.72)
Identity alteration	.50 (.70)	.37 (.89)	.73 (.23)	.49 (.73)
Conversion	.37 (.90)	.49 (.73)	.81 (.09)	.44 (.75)
Amnesia	.77 (.15)	.29 (.93)	.42 (.81)	.40 (.87)
Hypermnesia	.75 (.12)	.17 (.99)	.64 (.40)	.48 (.74)
Total SSD	.54 (.60)	.31 (.94)	.78 (.13)	.45 (.80)

**Table 9.5.16** Canonical analysis: *Hyperventilation / left frontal electrode*

( <i>n</i> =10)	<i>Delta:</i>	<i>Theta:</i>	<i>Alpha:</i>	<i>Beta:</i>
<i>SSD subscale score</i>	<i>Canonical R (p)</i>	<i>Canonical R (p)</i>	<i>Canonical R (p)</i>	<i>Canonical R (p)</i>
Derealisation	.50 (.64)	.55 (.62)	.53 (.70)	.33 (.94)
Depersonalisation	.83 (.03)	.91 (.02)	.83 (.10)	.65 (.46)
Identity confusion	.92 (.01)	.90 (.03)	.66 (.42)	.69 (.36)
Identity alteration	.91 (.004)	.87 (.06)	.59 (.58)	.66 (.43)
Conversion	.78 (.20)	.61 (.56)	.68 (.41)	.35 (.93)
Amnesia	.54 (.63)	.91 (.01)	.78 (.13)	.60 (.56)
Hypermnesia	.70 (.36)	.61 (.53)	.82 (.12)	.24 (.98)
Total SSD	.85 (.04)	.89 (.03)	.68 (.39)	.66 (.43)

**Table 9.5.17** Canonical analysis: *Mirror / right frontal electrode*

( <i>n</i> =11)	<i>Delta:</i>	<i>Theta:</i>	<i>Alpha:</i>	<i>Beta:</i>
<i>SSD subscale score</i>	<i>Canonical R (p)</i>	<i>Canonical R (p)</i>	<i>Canonical R (p)</i>	<i>Canonical R (p)</i>
Derealisation	.86 (.04)	.58 (.38)	.61 (.45)	.86 (.04)
Depersonalisation	.82 (.08)	.64 (.24)	.65 (.19)	.87 (.02)
Identity confusion	.82 (.07)	.77 (.15)	.74 (.20)	.83 (.07)
Identity alteration	.82 (.07)	.69 (.21)	.72 (.18)	.73 (.22)
Conversion	.83 (.06)	.70 (.28)	.65 (.33)	.80 (.04)
Amnesia	.66 (.32)	.61 (.47)	.50 (.70)	.73 (.22)
Hypermnesia	.91 (.01)	.74 (.13)	.78 (.09)	.80 (.08)
Total SSD	.89 (.02)	.66 (.31)	.69 (.27)	.85 (.05)

**Table 9.5.18** Canonical analysis: *4 Hz / right frontal electrode*

( <i>n</i> =11)	<i>Delta:</i>	<i>Theta:</i>	<i>Alpha:</i>	<i>Beta:</i>
<i>SSD subscale score</i>	<i>Canonical R (p)</i>	<i>Canonical R (p)</i>	<i>Canonical R (p)</i>	<i>Canonical R (p)</i>
Derealisation	.75 (.18)	.54 (.36)	.67 (.18)	.68 (.21)
Depersonalisation	.81 (.09)	.42 (.71)	.71 (.07)	.84 (.05)
Identity confusion	.75 (.17)	.67 (.29)	.80 (.03)	.84 (.04)
Identity alteration	.71 (.27)	.49 (.62)	.73 (.06)	.51 (.60)
Conversion	.66 (.33)	.45 (.78)	.66 (.34)	.70 (.28)
Amnesia	.57 (.47)	.67 (.27)	.71 (.14)	.82 (.06)
Hypermnesia	.82 (.07)	.62 (.45)	.78 (.06)	.66 (.35)
Total SSD	.77 (.14)	.57 (.45)	.74 (.04)	.70 (.23)

**Table 9.5.19** Canonical analysis: *14 Hz / right frontal electrode*

( <i>n</i> =11)	<i>Delta:</i>	<i>Theta:</i>	<i>Alpha:</i>	<i>Beta:</i>
<i>SSD subscale score</i>	<i>Canonical R (p)</i>	<i>Canonical R (p)</i>	<i>Canonical R (p)</i>	<i>Canonical R (p)</i>
Derealisation	.35 (.91)	.44 (.80)	.62 (.40)	.65 (.30)
Depersonalisation	.42 (.77)	.27 (.97)	.55 (.57)	.61 (.48)
Identity confusion	.45 (.68)	.40 (.86)	.56 (.58)	.64 (.27)
Identity alteration	.48 (.72)	.31 (.92)	.55 (.50)	.81 (.08)
Conversion	.54 (.64)	.52 (.60)	.62 (.24)	.83 (.06)
Amnesia	.53 (.62)	.50 (.68)	.42 (.81)	.57 (.35)
Hypermnesia	.76 (.09)	.52 (.68)	.77 (.14)	.93 (.01)
Total SSD	.51 (.65)	.34 (.89)	.54 (.53)	.80 (.09)

**Table 9.5.20** Canonical analysis: *Hyperventilation / right frontal electrode*

( <i>n</i> =10)	<i>Delta:</i>	<i>Theta:</i>	<i>Alpha:</i>	<i>Beta:</i>
<i>SSD subscale score</i>	<i>Canonical R (p)</i>	<i>Canonical R (p)</i>	<i>Canonical R (p)</i>	<i>Canonical R (p)</i>
Derealisation	.55 (.64)	.59 (.60)	.50 (.68)	.35 (.85)
Depersonalisation	.90 (.01)	.85 (.08)	.80 (.15)	.68 (.33)
Identity confusion	.89 (.03)	.75 (.24)	.67 (.43)	.65 (.35)
Identity alteration	.87 (.02)	.71 (.32)	.63 (.51)	.63 (.44)
Conversion	.59 (.44)	.70 (.33)	.59 (.57)	.47 (.68)
Amnesia	.79 (.18)	.94 (.01)	.78 (.11)	.72 (.30)
Hypermnesia	.56 (.45)	.82 (.10)	.86 (.07)	.71 (.31)
Total SSD	.87 (.03)	.85 (.08)	.69 (.38)	.66 (.32)



**Table 9.5.21** Canonical analysis: *Mirror / left parietal electrode*

<i>(n=11)</i>	<i>Delta:</i>	<i>Theta:</i>	<i>Alpha:</i>	<i>Beta:</i>
<i>SSD subscale score</i>	<i>Canonical R (p)</i>	<i>Canonical R (p)</i>	<i>Canonical R (p)</i>	<i>Canonical R (p)</i>
Derealisation	.72 (.14)	.64 (.28)	.41 (.75)	.59 (.51)
Depersonalisation	.73 (.18)	.66 (.24)	.69 (.27)	.71 (.12)
Identity confusion	.83 (.05)	<b>.93 (.004)</b>	.46 (.76)	.79 (.11)
Identity alteration	<b>.88 (.02)</b>	.84 (.04)	.46 (.76)	.66 (.28)
Conversion	.86 (.04)	.82 (.08)	.46 (.78)	.75 (.16)
Amnesia	.31 (.87)	.45 (.79)	.54 (.46)	.62 (.41)
Hypermnesia	.86 (.04)	.83 (.06)	.65 (.40)	.73 (.09)
Total SSD	.81 (.07)	.74 (.15)	.45 (.67)	.65 (.35)

**Table 9.5.22** Canonical analysis: *4 Hz / left parietal electrode*

<i>(n=11)</i>	<i>Delta:</i>	<i>Theta:</i>	<i>Alpha:</i>	<i>Beta:</i>
<i>SSD subscale score</i>	<i>Canonical R (p)</i>	<i>Canonical R (p)</i>	<i>Canonical R (p)</i>	<i>Canonical R (p)</i>
Derealisation	.83 (.04)	.60 (.49)	.69 (.21)	<b>.89 (.01)</b>
Depersonalisation	.87 (.03)	.30 (.95)	<b>.94 (.002)</b>	<b>.88 (.01)</b>
Identity confusion	.77 (.12)	.51 (.69)	<b>.88 (.01)</b>	<b>.84 (.01)</b>
Identity alteration	.87 (.03)	.52 (.66)	.75 (.12)	<b>.89 (.01)</b>
Conversion	.87 (.03)	.33 (.93)	.71 (.23)	.84 (.05)
Amnesia	.53 (.56)	.46 (.77)	.76 (.11)	.59 (.19)
Hypermnesia	.83 (.06)	.37 (.89)	.75 (.19)	.79 (.09)
Total SSD	<b>.87 (.02)</b>	.53 (.64)	.85 (.03)	<b>.87 (.01)</b>

**Table 9.5.23** Canonical analysis: *14 Hz / left parietal electrode*

<i>(n=11)</i>	<i>Delta:</i>	<i>Theta:</i>	<i>Alpha:</i>	<i>Beta:</i>
<i>SSD subscale score</i>	<i>Canonical R (p)</i>	<i>Canonical R (p)</i>	<i>Canonical R (p)</i>	<i>Canonical R (p)</i>
Derealisation	.39 (.86)	.26 (.96)	.46 (.72)	.69 (.30)
Depersonalisation	.35 (.82)	.33 (.91)	.34 (.89)	.65 (.39)
Identity confusion	.36 (.90)	.42 (.81)	.32 (.92)	.79 (.10)
Identity alteration	.33 (.93)	.39 (.87)	.31 (.94)	.71 (.26)
Conversion	.43 (.75)	.45 (.77)	.53 (.64)	.66 (.33)
Amnesia	.30 (.89)	.32 (.92)	.33 (.93)	.82 (.06)
Hypermnesia	.59 (.53)	.62 (.47)	.37 (.84)	.63 (.43)
Total SSD	.35 (.91)	.40 (.86)	.37 (.89)	.70 (.28)

**Table 9.5.24** Canonical analysis: *Hyperventilation / left parietal electrode*

<i>(n=10)</i>	<i>Delta:</i>	<i>Theta:</i>	<i>Alpha:</i>	<i>Beta:</i>
<i>SSD subscale score</i>	<i>Canonical R (p)</i>	<i>Canonical R (p)</i>	<i>Canonical R (p)</i>	<i>Canonical R (p)</i>
Derealisation	.59 (.59)	.67 (.43)	.85 (.07)	.24 (.99)
Depersonalisation	.79 (.16)	.81 (.14)	.67 (.36)	.34 (.90)
Identity confusion	.71 (.32)	.70 (.36)	.40 (.88)	.28 (.97)
Identity alteration	.68 (.40)	.64 (.49)	.51 (.67)	.34 (.94)
Conversion	.60 (.58)	.76 (.22)	<b>.94 (.01)</b>	.31 (.95)
Amnesia	.75 (.23)	<b>.90 (.02)</b>	.40 (.78)	.39 (.90)
Hypermnesia	.58 (.61)	.86 (.06)	.49 (.78)	.54 (.64)
Total SSD	.75 (.25)	.82 (.12)	.67 (.39)	.32 (.93)

**Table 9.5.25** Canonical analysis: *Mirror / right parietal electrode*

( <i>n</i> =11)	<i>Delta:</i>	<i>Theta:</i>	<i>Alpha:</i>	<i>Beta:</i>
<i>SSD subscale score</i>	<i>Canonical R (p)</i>	<i>Canonical R (p)</i>	<i>Canonical R (p)</i>	<i>Canonical R (p)</i>
Derealisation	.87 (.03)	.64 (.28)	.37 (.89)	.70 (.25)
Depersonalisation	.82 (.06)	.70 (.21)	.72 (.24)	.72 (.11)
Identity confusion	.96 (.001)	.89 (.02)	.58 (.54)	.81 (.09)
Identity alteration	.97 (.0002)	.83 (.04)	.46 (.66)	.73 (.16)
Conversion	.92 (.01)	.85 (.05)	.53 (.63)	.78 (.11)
Amnesia	.31 (.90)	.37 (.89)	.40 (.72)	.63 (.43)
Hypermnesia	.89 (.02)	.83 (.07)	.63 (.40)	.75 (.07)
Total SSD	.88 (.02)	.72 (.18)	.45 (.77)	.78 (.12)

**Table 9.5.26** Canonical analysis: *4 Hz / right parietal electrode*

( <i>n</i> =11)	<i>Delta:</i>	<i>Theta:</i>	<i>Alpha:</i>	<i>Beta:</i>
<i>SSD subscale score</i>	<i>Canonical R (p)</i>	<i>Canonical R (p)</i>	<i>Canonical R (p)</i>	<i>Canonical R (p)</i>
Derealisation	.80 (.08)	.56 (.57)	.70 (.21)	.89 (.01)
Depersonalisation	.78 (.14)	.24 (.98)	.84 (.04)	.94 (.001)
Identity confusion	.65 (.35)	.40 (.80)	.82 (.05)	.94 (.0003)
Identity alteration	.80 (.10)	.37 (.89)	.81 (.07)	.84 (.01)
Conversion	.81 (.09)	.36 (.90)	.81 (.08)	.90 (.01)
Amnesia	.36 (.87)	.45 (.67)	.71 (.20)	.78 (.02)
Hypermnesia	.71 (.25)	.42 (.69)	.76 (.16)	.77 (.09)
Total SSD	.73 (.19)	.38 (.86)	.88 (.02)	.91 (.002)

**Table 9.5.27** Canonical analysis: *14 Hz / right parietal electrode*

( <i>n</i> =11)	<i>Delta:</i>	<i>Theta:</i>	<i>Alpha:</i>	<i>Beta:</i>
<i>SSD subscale score</i>	<i>Canonical R (p)</i>	<i>Canonical R (p)</i>	<i>Canonical R (p)</i>	<i>Canonical R (p)</i>
Derealisation	.28 (.95)	.32 (.91)	.39 (.85)	.48 (.74)
Depersonalisation	.52 (.65)	.45 (.76)	.20 (.98)	.49 (.69)
Identity confusion	.36 (.90)	.54 (.60)	.17 (.99)	.61 (.39)
Identity alteration	.40 (.86)	.50 (.68)	.19 (.99)	.57 (.57)
Conversion	.37 (.86)	.42 (.84)	.50 (.70)	.53 (.48)
Amnesia	.43 (.79)	.29 (.96)	.28 (.96)	.67 (.30)
Hypermnesia	.53 (.55)	.73 (.22)	.47 (.75)	.73 (.22)
Total SSD	.34 (.92)	.49 (.70)	.24 (.98)	.55 (.61)

**Table 9.5.28** Canonical analysis: *Hyperventilation / right parietal electrode*

( <i>n</i> =10)	<i>Delta:</i>	<i>Theta:</i>	<i>Alpha:</i>	<i>Beta:</i>
<i>SSD subscale score</i>	<i>Canonical R (p)</i>	<i>Canonical R (p)</i>	<i>Canonical R (p)</i>	<i>Canonical R (p)</i>
Derealisation	.51 (.74)	.62 (.53)	.90 (.03)	.16 (.99)
Depersonalisation	.76 (.24)	.81 (.15)	.78 (.17)	.35 (.93)
Identity confusion	.67 (.43)	.69 (.39)	.59 (.58)	.29 (.97)
Identity alteration	.63 (.50)	.63 (.50)	.70 (.33)	.28 (.97)
Conversion	.60 (.57)	.74 (.27)	.88 (.05)	.21 (.99)
Amnesia	.73 (.25)	.90 (.02)	.47 (.58)	.33 (.91)
Hypermnesia	.62 (.50)	.88 (.04)	.44 (.84)	.29 (.93)
Total SSD	.71 (.35)	.81 (.14)	.79 (.18)	.26 (.98)



**Table 9.5.29** Canonical analysis: *Mirror / left occipital electrode*

( <i>n</i> =11)	<i>Delta:</i>	<i>Theta:</i>	<i>Alpha:</i>	<i>Beta:</i>
<i>SSD subscale score</i>	<i>Canonical R (p)</i>	<i>Canonical R (p)</i>	<i>Canonical R (p)</i>	<i>Canonical R (p)</i>
Derealisation	.58 (.40)	.70 (.20)	.35 (.82)	.80 (.09)
Depersonalisation	.55 (.51)	.68 (.17)	.53 (.57)	.75 (.06)
Identity confusion	.71 (.25)	.90 (.01)	.44 (.80)	.87 (.03)
Identity alteration	.75 (.14)	.86 (.03)	.50 (.70)	.83 (.05)
Conversion	.73 (.21)	.86 (.04)	.31 (.95)	.87 (.02)
Amnesia	.24 (.98)	.51 (.68)	.42 (.61)	.67 (.34)
Hypermnesia	.78 (.13)	.86 (.03)	.28 (.95)	.81 (.05)
Total SSD	.65 (.34)	.77 (.11)	.46 (.71)	.81 (.07)

**Table 9.5.30** Canonical analysis: *4 Hz / left occipital electrode*

( <i>n</i> =11)	<i>Delta:</i>	<i>Theta:</i>	<i>Alpha:</i>	<i>Beta:</i>
<i>SSD subscale score</i>	<i>Canonical R (p)</i>	<i>Canonical R (p)</i>	<i>Canonical R (p)</i>	<i>Canonical R (p)</i>
Derealisation	.69 (.22)	.77 (.14)	.38 (.80)	.77 (.08)
Depersonalisation	.84 (.05)	.65 (.38)	.63 (.31)	.68 (.27)
Identity confusion	.77 (.14)	.66 (.31)	.56 (.37)	.75 (.02)
Identity alteration	.72 (.23)	.75 (.16)	.54 (.56)	.72 (.05)
Conversion	.73 (.20)	.66 (.36)	.47 (.63)	.65 (.30)
Amnesia	.60 (.48)	.48 (.68)	.51 (.49)	.79 (.04)
Hypermnesia	.77 (.12)	.60 (.47)	.38 (.88)	.63 (.24)
Total SSD	.78 (.11)	.72 (.20)	.54 (.48)	.73 (.05)

**Table 9.5.31** Canonical analysis: *14 Hz / left occipital electrode*

( <i>n</i> =11)	<i>Delta:</i>	<i>Theta:</i>	<i>Alpha:</i>	<i>Beta:</i>
<i>SSD subscale score</i>	<i>Canonical R (p)</i>	<i>Canonical R (p)</i>	<i>Canonical R (p)</i>	<i>Canonical R (p)</i>
Derealisation	.38 (.86)	.46 (.75)	.34 (.88)	.71 (.15)
Depersonalisation	.33 (.85)	.52 (.66)	.30 (.93)	.65 (.32)
Identity confusion	.29 (.95)	.61 (.47)	.32 (.94)	.82 (.02)
Identity alteration	.29 (.95)	.58 (.52)	.28 (.96)	.76 (.09)
Conversion	.43 (.77)	.59 (.52)	.44 (.79)	.72 (.22)
Amnesia	.34 (.90)	.42 (.77)	.35 (.91)	.77 (.06)
Hypermnesia	.62 (.46)	.74 (.20)	.47 (.74)	.68 (.24)
Total SSD	.31 (.93)	.59 (.51)	.30 (.94)	.76 (.08)

**Table 9.5.32** Canonical analysis: *Hyperventilation / left occipital electrode*

( <i>n</i> =10)	<i>Delta:</i>	<i>Theta:</i>	<i>Alpha:</i>	<i>Beta:</i>
<i>SSD subscale score</i>	<i>Canonical R (p)</i>	<i>Canonical R (p)</i>	<i>Canonical R (p)</i>	<i>Canonical R (p)</i>
Derealisation	.55 (.67)	.69 (.31)	.72 (.28)	.35 (.93)
Depersonalisation	.86 (.06)	.88 (.04)	.39 (.83)	.40 (.87)
Identity confusion	.80 (.14)	.77 (.20)	.36 (.91)	.29 (.96)
Identity alteration	.77 (.21)	.76 (.22)	.37 (.82)	.42 (.87)
Conversion	.58 (.61)	.73 (.28)	.79 (.16)	.40 (.89)
Amnesia	.82 (.11)	.86 (.04)	.38 (.91)	.42 (.85)
Hypermnesia	.59 (.60)	.70 (.36)	.30 (.94)	.63 (.50)
Total SSD	.81 (.14)	.89 (.04)	.45 (.77)	.44 (.85)

**Table 9.5.33** Canonical analysis: *Mirror / right occipital electrode*

( <i>n=11</i> )	<i>Delta:</i>	<i>Theta:</i>	<i>Alpha:</i>	<i>Beta:</i>
<i>SSD subscale score</i>	<i>Canonical R (p)</i>	<i>Canonical R (p)</i>	<i>Canonical R (p)</i>	<i>Canonical R (p)</i>
Derealisation	.44 (.72)	.61 (.31)	.35 (.88)	.77 (.11)
Depersonalisation	.49 (.72)	.69 (.24)	.53 (.63)	.76 (.10)
Identity confusion	.78 (.14)	.83 (.07)	.47 (.76)	.81 (.09)
Identity alteration	.73 (.22)	.80 (.08)	.49 (.72)	.78 (.12)
Conversion	.82 (.08)	.86 (.04)	.34 (.92)	.80 (.08)
Amnesia	.27 (.97)	.36 (.91)	.39 (.67)	.60 (.48)
Hypermnesia	.76 (.17)	.81 (.10)	.30 (.95)	.77 (.11)
Total SSD	.60 (.49)	.68 (.25)	.45 (.78)	.76 (.14)

**Table 9.5.34** Canonical analysis: *4 Hz / right occipital electrode*

( <i>n=11</i> )	<i>Delta:</i>	<i>Theta:</i>	<i>Alpha:</i>	<i>Beta:</i>
<i>SSD subscale score</i>	<i>Canonical R (p)</i>	<i>Canonical R (p)</i>	<i>Canonical R (p)</i>	<i>Canonical R (p)</i>
Derealisation	.42 (.77)	.71 (.22)	.63 (.42)	.70 (.10)
Depersonalisation	.49 (.72)	.60 (.51)	.51 (.54)	.66 (.30)
Identity confusion	.36 (.91)	.53 (.58)	.70 (.22)	.83 (.01)
Identity alteration	.52 (.67)	.75 (.17)	.60 (.50)	.80 (.03)
Conversion	.51 (.68)	.64 (.38)	.42 (.76)	.72 (.13)
Amnesia	.16 (.99)	.32 (.89)	.72 (.21)	.85 (.02)
Hypermnesia	.59 (.52)	.67 (.35)	.10 (>.99)	.57 (.39)
Total SSD	.46 (.77)	.65 (.35)	.60 (.45)	.77 (.03)

**Table 9.5.35** Canonical analysis: *14 Hz / right occipital electrode*

( <i>n=11</i> )	<i>Delta:</i>	<i>Theta:</i>	<i>Alpha:</i>	<i>Beta:</i>
<i>SSD subscale score</i>	<i>Canonical R (p)</i>	<i>Canonical R (p)</i>	<i>Canonical R (p)</i>	<i>Canonical R (p)</i>
Derealisation	.31 (.91)	.60 (.49)	.23 (.96)	.63 (.27)
Depersonalisation	.48 (.71)	.65 (.37)	.23 (.98)	.60 (.47)
Identity confusion	.15 (>.99)	.72 (.23)	.27 (.96)	.83 (.02)
Identity alteration	.15 (>.99)	.74 (.19)	.18 (.99)	.69 (.18)
Conversion	.26 (.97)	.53 (.65)	.38 (.87)	.67 (.32)
Amnesia	.63 (.44)	.45 (.77)	.32 (.93)	.84 (.02)
Hypermnesia	.44 (.76)	.75 (.18)	.44 (.81)	.60 (.38)
Total SSD	.12 (>.99)	.70 (.27)	.20 (.99)	.70 (.15)

**Table 9.5.36** Canonical analysis: *Hyperventilation / right occipital electrode*

( <i>n=10</i> )	<i>Delta:</i>	<i>Theta:</i>	<i>Alpha:</i>	<i>Beta:</i>
<i>SSD subscale score</i>	<i>Canonical R (p)</i>	<i>Canonical R (p)</i>	<i>Canonical R (p)</i>	<i>Canonical R (p)</i>
Derealisation	.48 (.78)	.62 (.46)	.63 (.53)	.24 (.98)
Depersonalisation	.83 (.11)	.91 (.02)	.25 (.95)	.30 (.95)
Identity confusion	.85 (.08)	.86 (.06)	.27 (.98)	.18 (.99)
Identity alteration	.81 (.14)	.85 (.08)	.29 (.93)	.35 (.93)
Conversion	.51 (.72)	.61 (.53)	.75 (.24)	.32 (.94)
Amnesia	.74 (.25)	.88 (.03)	.61 (.54)	.35 (.92)
Hypermnesia	.45 (.80)	.64 (.46)	.32 (.88)	.48 (.79)
Total SSD	.78 (.18)	.90 (.03)	.30 (.95)	.32 (.95)



Table 9.6.1 Significant canonical correlations: *Total SSD score*

	$\delta$ <i>mir</i>	$\delta$ 4 Hz	$\delta$ 14 Hz	$\delta$ <i>HV</i>	$\theta$ <i>mir</i>	$\theta$ 4 Hz	$\theta$ 14 Hz	$\theta$ <i>HV</i>	$\alpha$ <i>mir</i>	$\alpha$ 4 Hz	$\alpha$ 14 Hz	$\alpha$ <i>HV</i>	$\beta$ <i>mir</i>	$\beta$ 4 Hz	$\beta$ 14 Hz	$\beta$ <i>HV</i>
<b>cz</b>	**															
<b>f3</b>				*				*								
<b>p3</b>		**								*					**	
<b>t3</b>								*		**	**					
<b>o1</b>								*							*	
<b>f4</b>	**			*						*			*			
<b>p4</b>	**									**					**	
<b>t4</b>		**			**				*							
<b>o2</b>								*							*	

*mir*: mirror staring; *HV*: hyperventilation  
\*: significant at the 0.05 level; \*\*: significant at the 0.02 level

Table 9.6.2 Significant canonical correlations: *Derealisation*

	$\delta$ <i>mir</i>	$\delta$ 4 Hz	$\delta$ 14 Hz	$\delta$ <i>HV</i>	$\theta$ <i>mir</i>	$\theta$ 4 Hz	$\theta$ 14 Hz	$\theta$ <i>HV</i>	$\alpha$ <i>mir</i>	$\alpha$ 4 Hz	$\alpha$ 14 Hz	$\alpha$ <i>HV</i>	$\beta$ <i>mir</i>	$\beta$ 4 Hz	$\beta$ 14 Hz	$\beta$ <i>HV</i>
<b>cz</b>																
<b>f3</b>											*					
<b>p3</b>		*													**	
<b>t3</b>										**	*					
<b>o1</b>																
<b>f4</b>	*												*			
<b>p4</b>	*											*			**	
<b>t4</b>		**			*				*							
<b>o2</b>																

*mir*: mirror staring; *HV*: hyperventilation  
\*: significant at the 0.05 level; \*\*: significant at the 0.02 level

Table 9.6.3 Significant canonical correlations: *Depersonalisation*

	$\delta$ <i>mir</i>	$\delta$ 4 Hz	$\delta$ 14 Hz	$\delta$ <i>HV</i>	$\theta$ <i>mir</i>	$\theta$ 4 Hz	$\theta$ 14 Hz	$\theta$ <i>HV</i>	$\alpha$ <i>mir</i>	$\alpha$ 4 Hz	$\alpha$ 14 Hz	$\alpha$ <i>HV</i>	$\beta$ <i>mir</i>	$\beta$ 4 Hz	$\beta$ 14 Hz	$\beta$ <i>HV</i>
<b>cz</b>								*								
<b>f3</b>		*		*				**								
<b>p3</b>		*								**					**	
<b>t3</b>								*		*	*	*	*			
<b>o1</b>		*						*								
<b>f4</b>				**									**	*		
<b>p4</b>										*					**	
<b>t4</b>	*	**			*				**	**			*	**		
<b>o2</b>								**								

*mir*: mirror staring; *HV*: hyperventilation  
\*: significant at the 0.05 level; \*\*: significant at the 0.02 level

**Table 9.6.4** Significant canonical correlations: *Identity confusion*

	$\delta$ <i>mir</i>	$\delta$ 4 Hz	$\delta$ 14 Hz	$\delta$ <i>HV</i>	$\theta$ <i>mir</i>	$\theta$ 4 Hz	$\theta$ 14 Hz	$\theta$ <i>HV</i>	$\alpha$ <i>mir</i>	$\alpha$ 4 Hz	$\alpha$ 14 Hz	$\alpha$ <i>HV</i>	$\beta$ <i>mir</i>	$\beta$ 4 Hz	$\beta$ 14 Hz	$\beta$ <i>HV</i>
<b>cz</b>	**														*	
<b>f3</b>				**				*								
<b>p3</b>	*				**					**					**	
<b>t3</b>											**		*			
<b>o1</b>					**								*	**	**	
<b>f4</b>				*						*				*		
<b>p4</b>	**				**					*				**		
<b>t4</b>		**								**				**		
<b>o2</b>														**	**	

*mir*: mirror staring; *HV*: hyperventilation  
\*: significant at the 0.05 level; \*\*: significant at the 0.02 level

**Table 9.6.5** Significant canonical correlations: *Identity alteration*

	$\delta$ <i>mir</i>	$\delta$ 4 Hz	$\delta$ 14 Hz	$\delta$ <i>HV</i>	$\theta$ <i>mir</i>	$\theta$ 4 Hz	$\theta$ 14 Hz	$\theta$ <i>HV</i>	$\alpha$ <i>mir</i>	$\alpha$ 4 Hz	$\alpha$ 14 Hz	$\alpha$ <i>HV</i>	$\beta$ <i>mir</i>	$\beta$ 4 Hz	$\beta$ 14 Hz	$\beta$ <i>HV</i>
<b>cz</b>	**															
<b>f3</b>				**						*						
<b>p3</b>	**	*			*										**	
<b>t3</b>										**	*					
<b>o1</b>					*								*	*		
<b>f4</b>				**												
<b>p4</b>	**				*										**	
<b>t4</b>		**														
<b>o2</b>															*	

*mir*: mirror staring; *HV*: hyperventilation  
\*: significant at the 0.05 level; \*\*: significant at the 0.02 level

**Table 9.6.6** Significant canonical correlations: *Conversion*

	$\delta$ <i>mir</i>	$\delta$ 4 Hz	$\delta$ 14 Hz	$\delta$ <i>HV</i>	$\theta$ <i>mir</i>	$\theta$ 4 Hz	$\theta$ 14 Hz	$\theta$ <i>HV</i>	$\alpha$ <i>mir</i>	$\alpha$ 4 Hz	$\alpha$ 14 Hz	$\alpha$ <i>HV</i>	$\beta$ <i>mir</i>	$\beta$ 4 Hz	$\beta$ 14 Hz	$\beta$ <i>HV</i>
<b>cz</b>	**											*				
<b>f3</b>																
<b>p3</b>	*	*										**		*		
<b>t3</b>										*	*					
<b>o1</b>					*								**			
<b>f4</b>													*			
<b>p4</b>	**				*							*			**	
<b>t4</b>		*														
<b>o2</b>					*											

*mir*: mirror staring; *HV*: hyperventilation  
\*: significant at the 0.05 level; \*\*: significant at the 0.02 level



**Table 9.6.7** Significant canonical correlations: *Amnesia*

	$\delta$ <i>mir</i>	$\delta$ 4 Hz	$\delta$ 14 Hz	$\delta$ <i>HV</i>	$\theta$ <i>mir</i>	$\theta$ 4 Hz	$\theta$ 14 Hz	$\theta$ <i>HV</i>	$\alpha$ <i>mir</i>	$\alpha$ 4 Hz	$\alpha$ 14 Hz	$\alpha$ <i>HV</i>	$\beta$ <i>mir</i>	$\beta$ 4 Hz	$\beta$ 14 Hz	$\beta$ <i>HV</i>
<b>cz</b>								**								
<b>f3</b>								**								
<b>p3</b>								**								
<b>t3</b>								**								
<b>o1</b>								*						*		
<b>f4</b>								**								
<b>p4</b>								**						**		
<b>t4</b>								*	*	**		**		*		
<b>o2</b>								*						**	**	

*mir*: mirror staring; *HV*: hyperventilation  
\*: significant at the 0.05 level; \*\*: significant at the 0.02 level

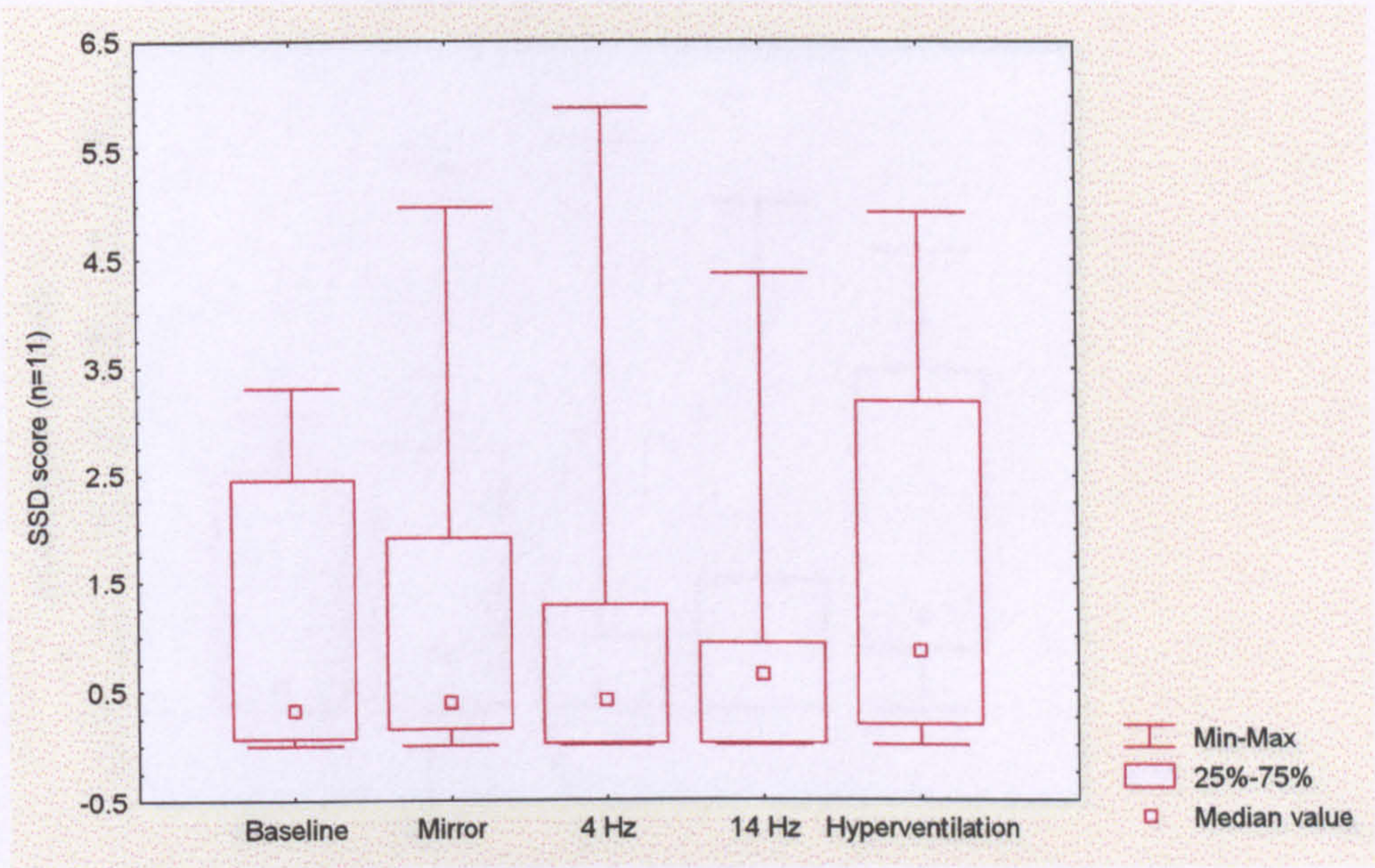
**Table 9.6.8** Significant canonical correlations: *Hypermnnesia*

	$\delta$ <i>mir</i>	$\delta$ 4 Hz	$\delta$ 14 Hz	$\delta$ <i>HV</i>	$\theta$ <i>mir</i>	$\theta$ 4 Hz	$\theta$ 14 Hz	$\theta$ <i>HV</i>	$\alpha$ <i>mir</i>	$\alpha$ 4 Hz	$\alpha$ 14 Hz	$\alpha$ <i>HV</i>	$\beta$ <i>mir</i>	$\beta$ 4 Hz	$\beta$ 14 Hz	$\beta$ <i>HV</i>
<b>cz</b>	**															
<b>f3</b>										*						
<b>p3</b>	*															
<b>t3</b>										**	**			**		
<b>o1</b>					*								*			
<b>f4</b>	**														**	
<b>p4</b>	**							*								
<b>t4</b>		**			*		**	**	**	**	**	**			**	
<b>o2</b>																

*mir*: mirror staring; *HV*: hyperventilation  
\*: significant at the 0.05 level; \*\*: significant at the 0.02 level



Figure 9.1.1 SSD scores over 5 conditions



Friedman test

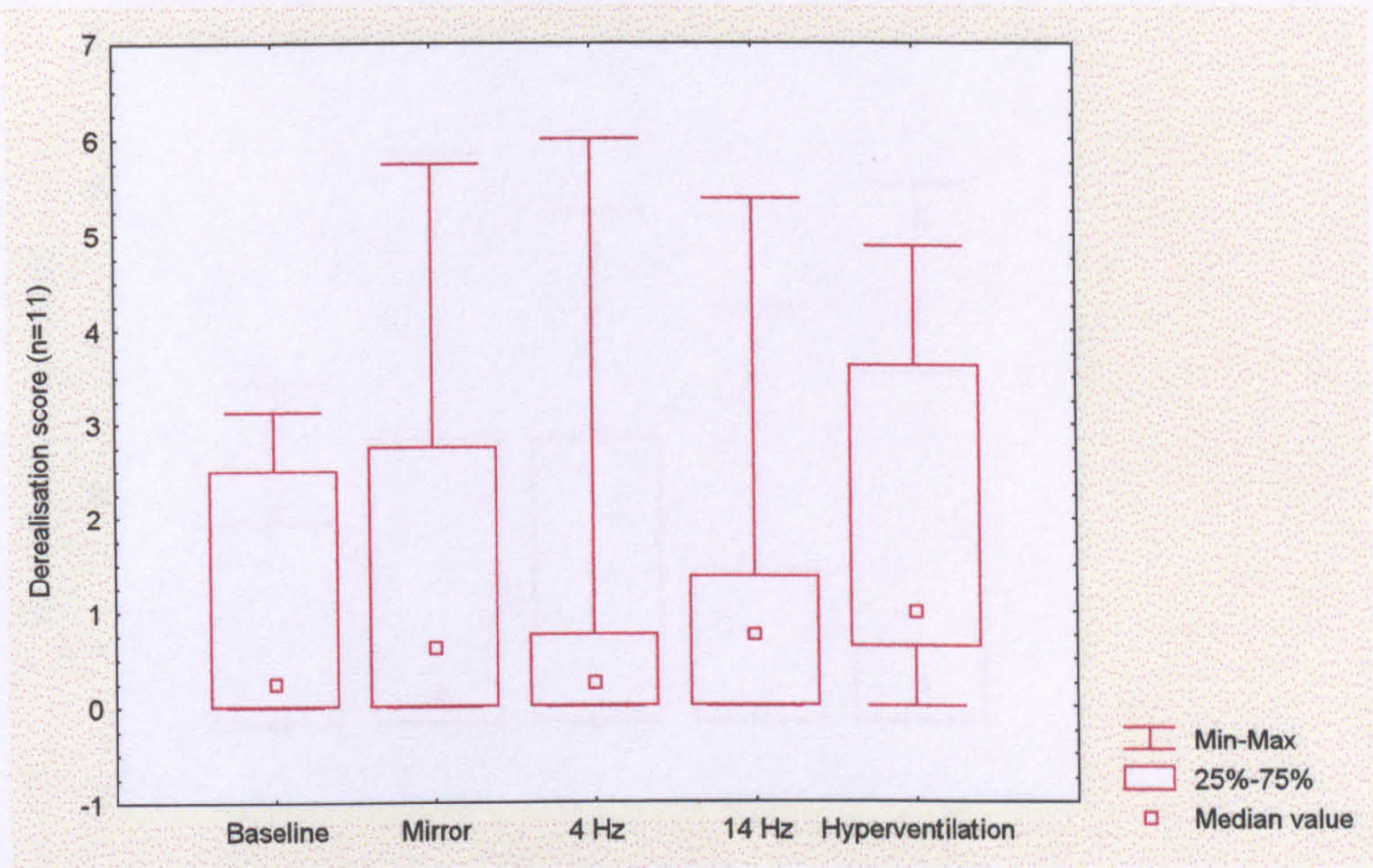
Ranks	
	Mean Rank
SSD1 score	2.77
SSD2 score	3.23
SSD3 score	2.55
SSD4 score	2.45
SSD5 score	4.00

Test Statistics <sup>a</sup>	
N	11
Chi-Square	7.627
df	4
Asymp. Sig.	.106

a. Friedman Test



Figure 9.1.2 Derealisation scores over 5 conditions



Friedman test

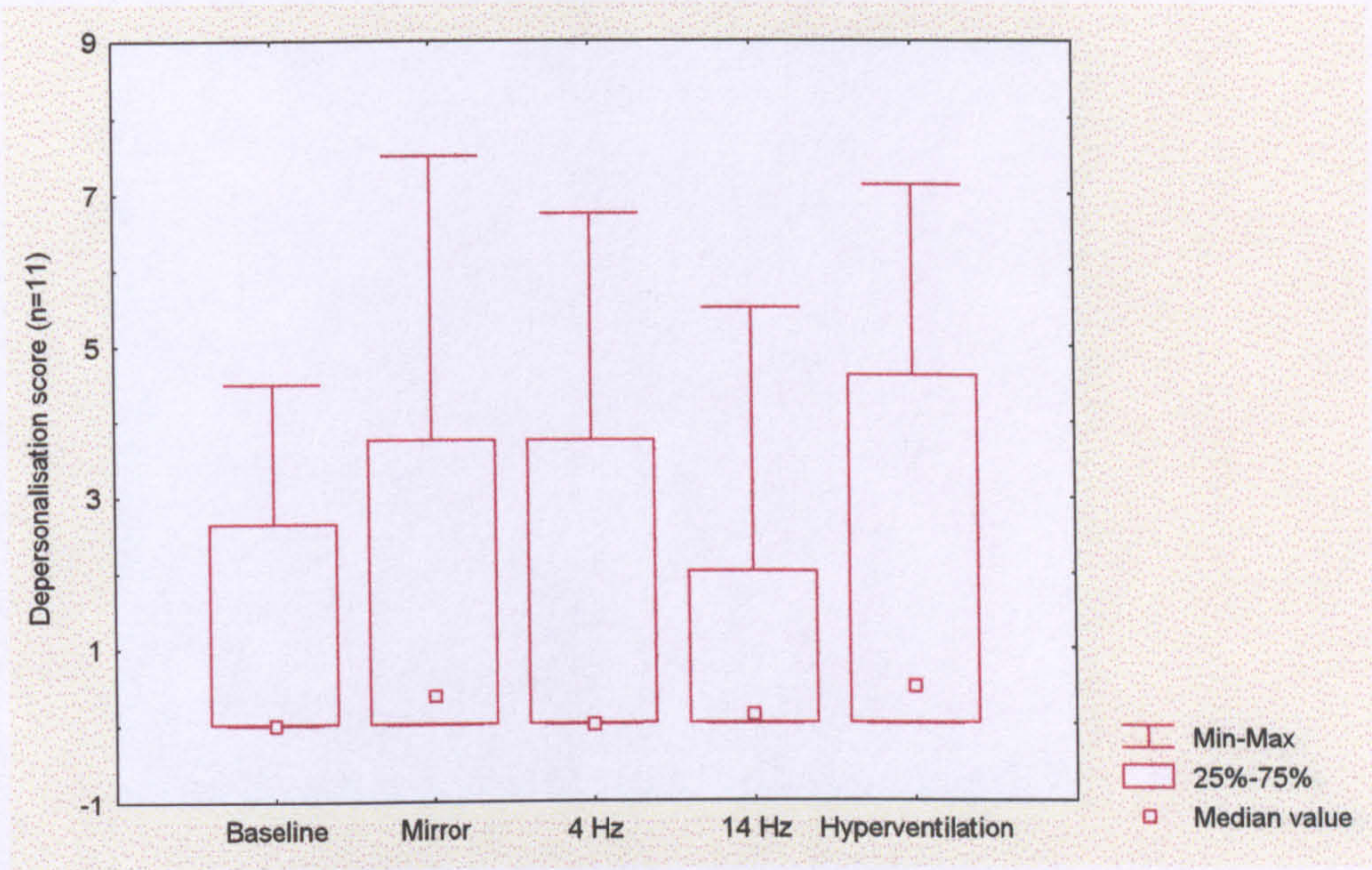
Ranks	
	Mean Rank
Derealisation SSD1	2.55
Derealisation SSD2	3.23
Derealisation SSD3	2.68
Derealisation SSD4	2.64
Derealisation SSD5	3.91

Test Statistics <sup>a</sup>	
N	11
Chi-Square	7.506
df	4
Asymp. Sig.	.111

a. Friedman Test



Figure 9.1.3 Depersonalisation scores over 5 conditions



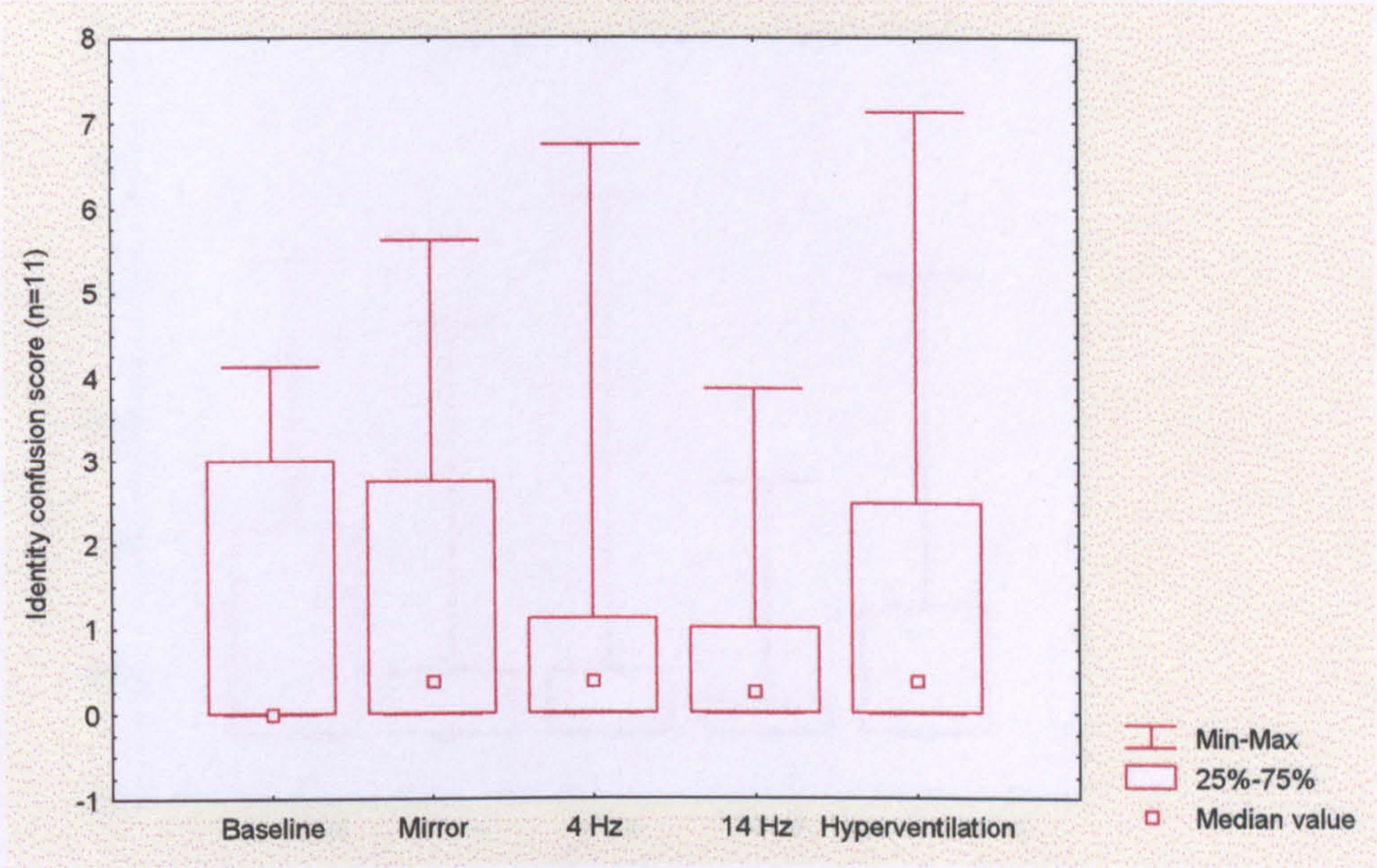
Friedman test

Ranks	
	Mean Rank
Depersonalisation SSD1	2.32
Depersonalisation SSD2	3.50
Depersonalisation SSD3	2.68
Depersonalisation SSD4	2.50
Depersonalisation SSD5	4.00

Test Statistics <sup>a</sup>	
N	11
Chi-Square	12.903
df	4
Asymp. Sig.	.012
a. Friedman Test	



Figure 9.1.4 Identity confusion scores over 5 conditions



Friedman test

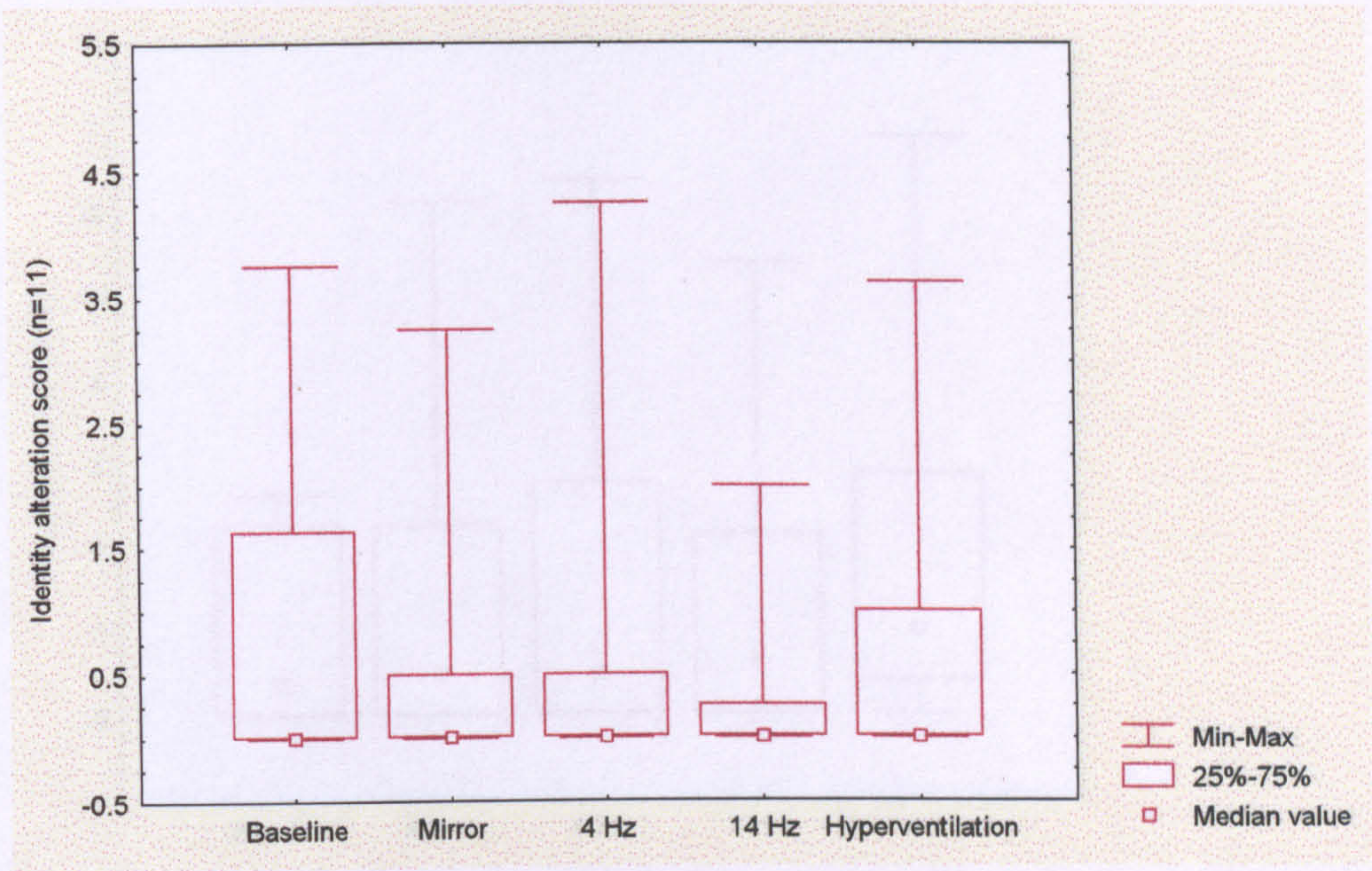
Ranks	
	Mean Rank
Identity confusion SSD1	2.91
Identity confusion SSD2	3.55
Identity confusion SSD3	2.68
Identity confusion SSD4	2.64
Identity confusion SSD5	3.23

Test Statistics <sup>a</sup>	
N	11
Chi-Square	4.115
df	4
Asymp. Sig.	.391

a. Friedman Test



Figure 9.1.5 Identity alteration scores over 5 conditions



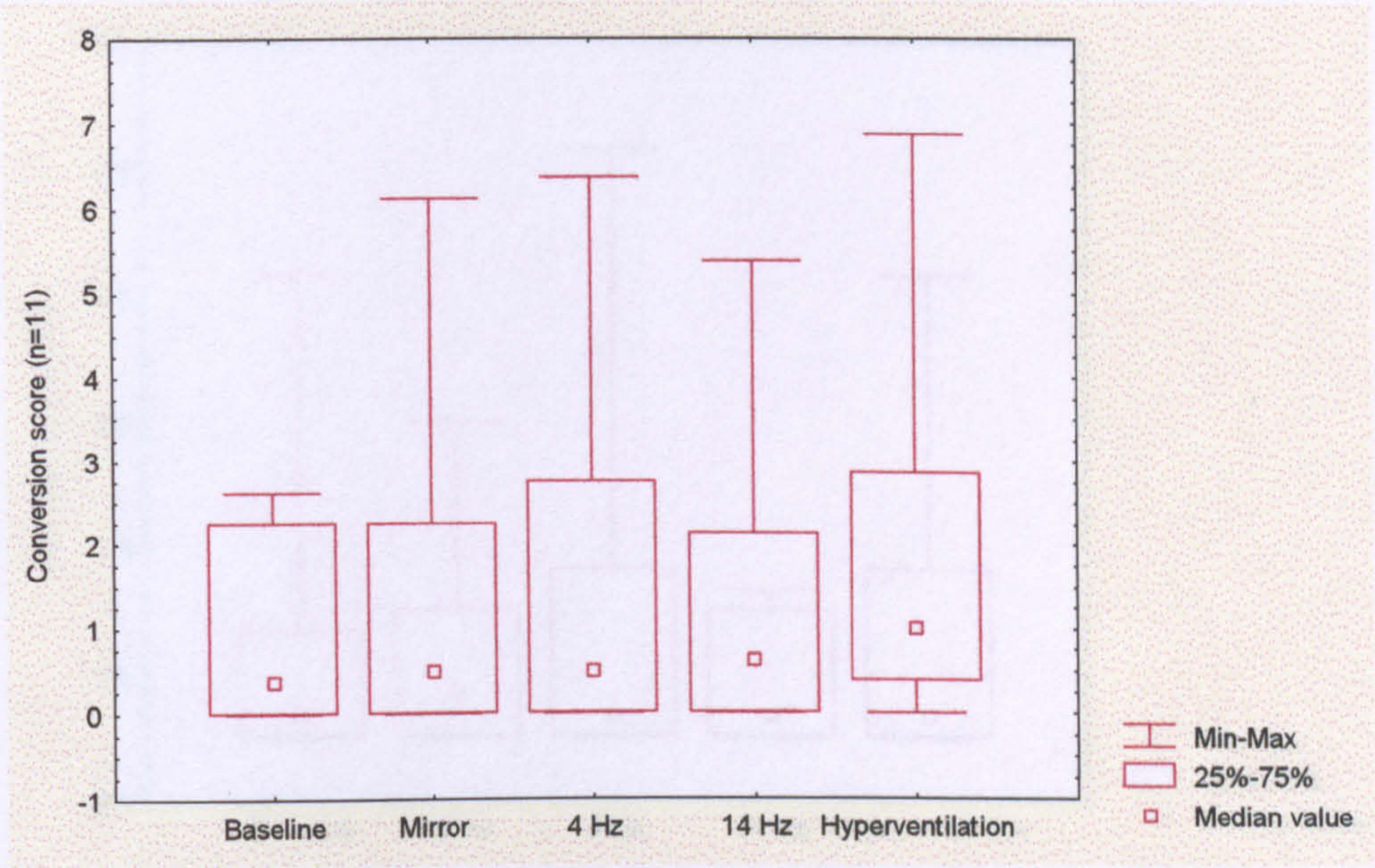
Friedman test

Ranks	
	Mean Rank
Identity alteration SSD1	3.36
Identity alteration SSD2	2.82
Identity alteration SSD3	3.09
Identity alteration SSD4	2.59
Identity alteration SSD5	3.14

Test Statistics <sup>a</sup>	
N	11
Chi-Square	3.080
df	4
Asymp. Sig.	.545
a. Friedman Test	



Figure 9.1.6 Conversion scores over 5 conditions



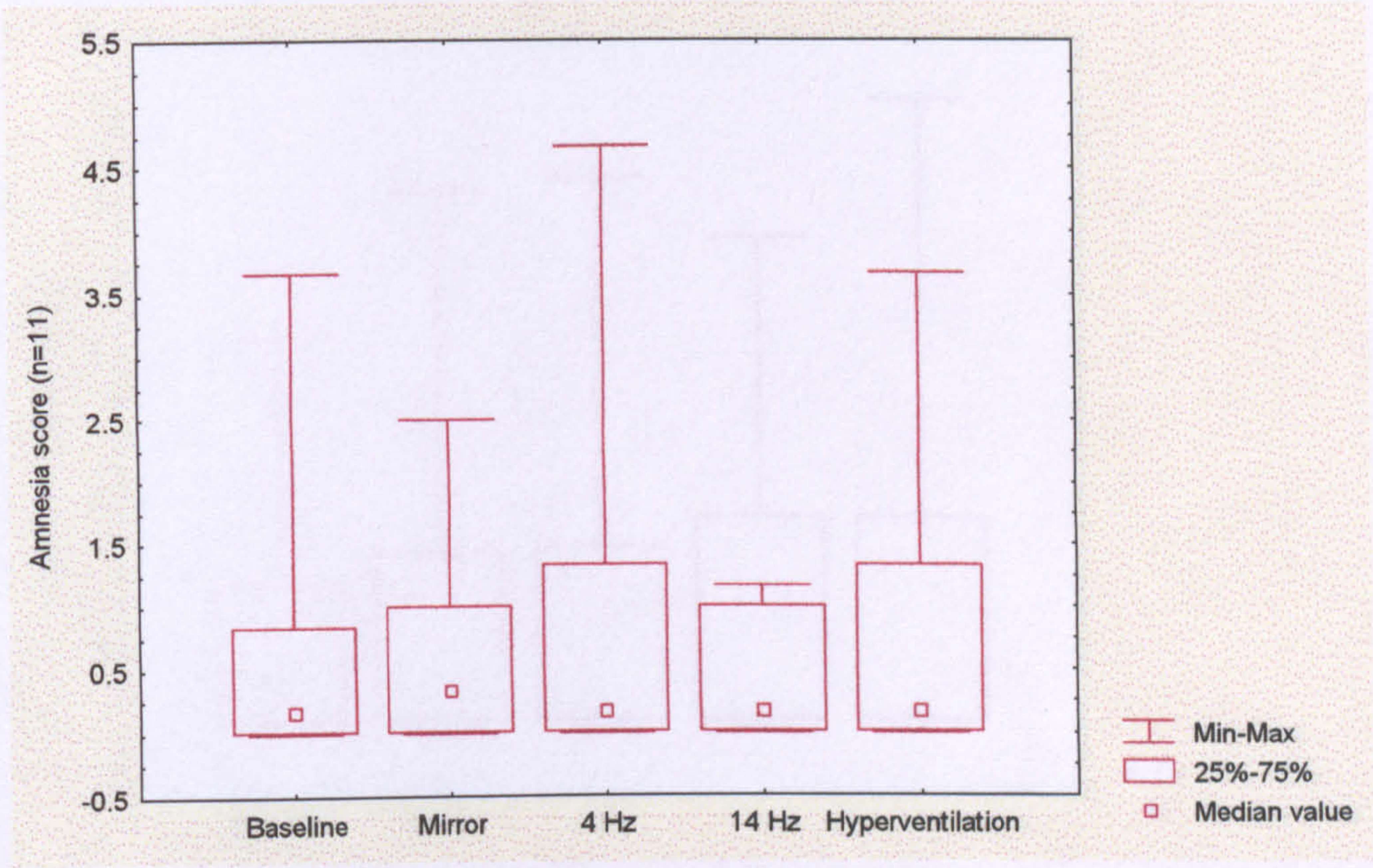
Friedman test

Ranks	
	Mean Rank
Conversion SSD1	2.18
Conversion SSD2	2.86
Conversion SSD3	3.09
Conversion SSD4	2.73
Conversion SSD5	4.14

Test Statistics <sup>a</sup>	
N	11
Chi-Square	10.617
df	4
Asymp. Sig.	.031
a. Friedman Test	



Figure 9.1.7 Amnesia scores over 5 conditions



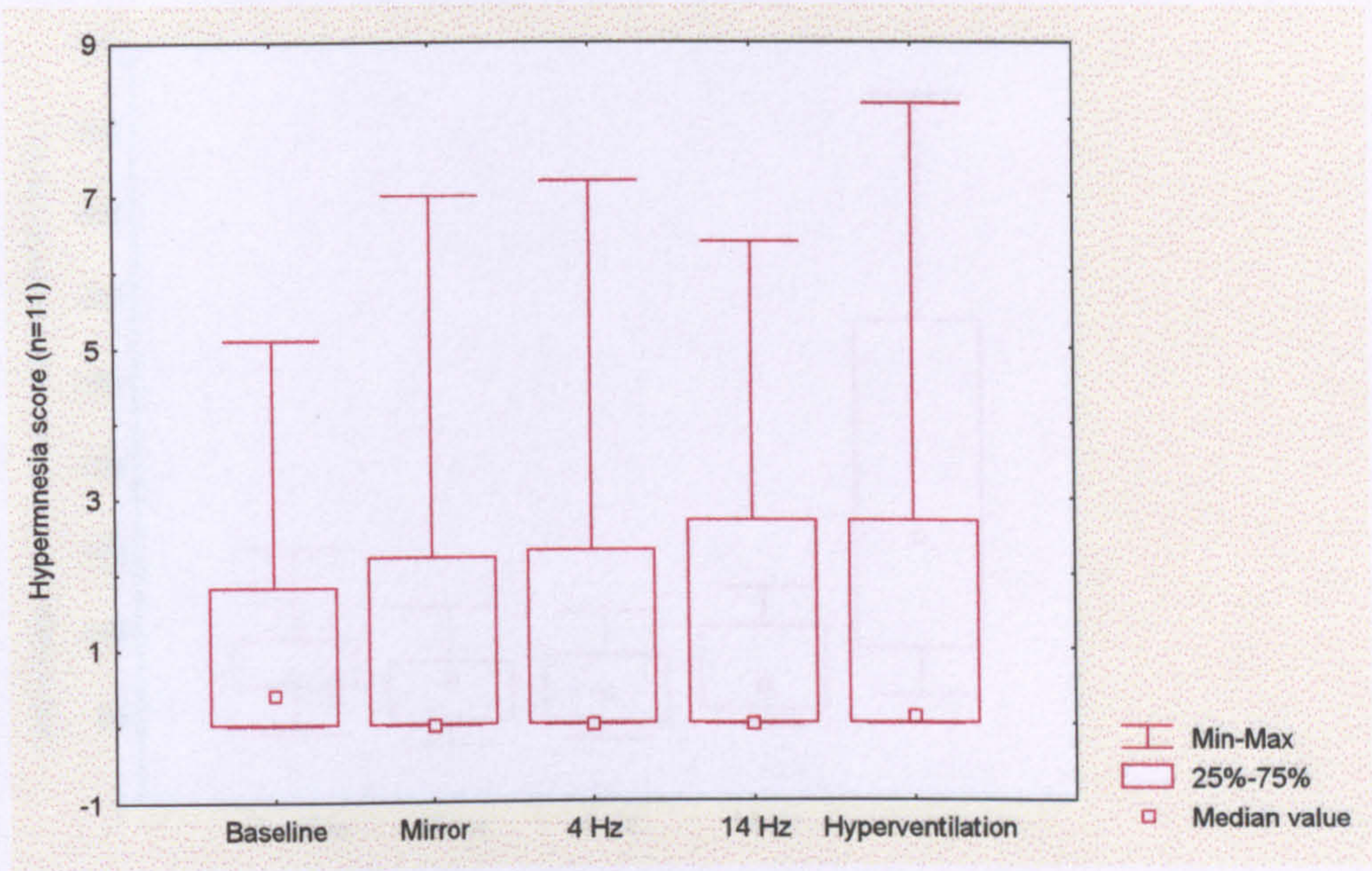
Friedman test

Ranks	
	Mean Rank
Amnesia SSD1	3.00
Amnesia SSD2	3.14
Amnesia SSD3	2.95
Amnesia SSD4	2.73
Amnesia SSD5	3.18

Test Statistics <sup>a</sup>	
N	11
Chi-Square	.919
df	4
Asymp. Sig.	.922
a. Friedman Test	



Figure 9.1.8 Hypermnesia scores over 5 conditions



Friedman test

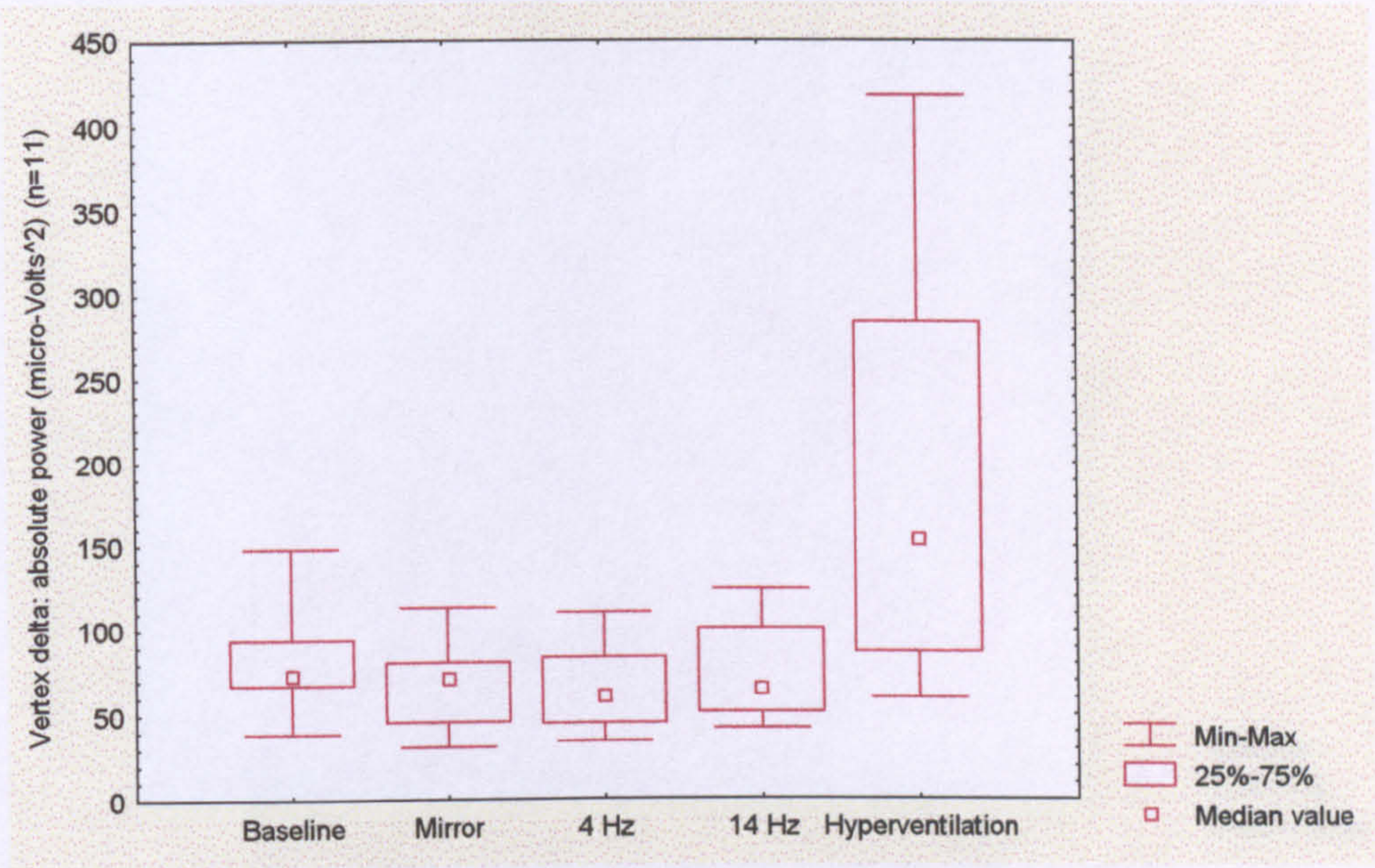
Ranks	
	Mean Rank
Hypermnesia SSD1	2.86
Hypermnesia SSD2	2.95
Hypermnesia SSD3	2.86
Hypermnesia SSD4	3.09
Hypermnesia SSD5	3.23

Test Statistics <sup>a</sup>	
N	11
Chi-Square	.722
df	4
Asymp. Sig.	.949

a. Friedman Test



Figure 9.2.1 Vertex delta power over 5 conditions



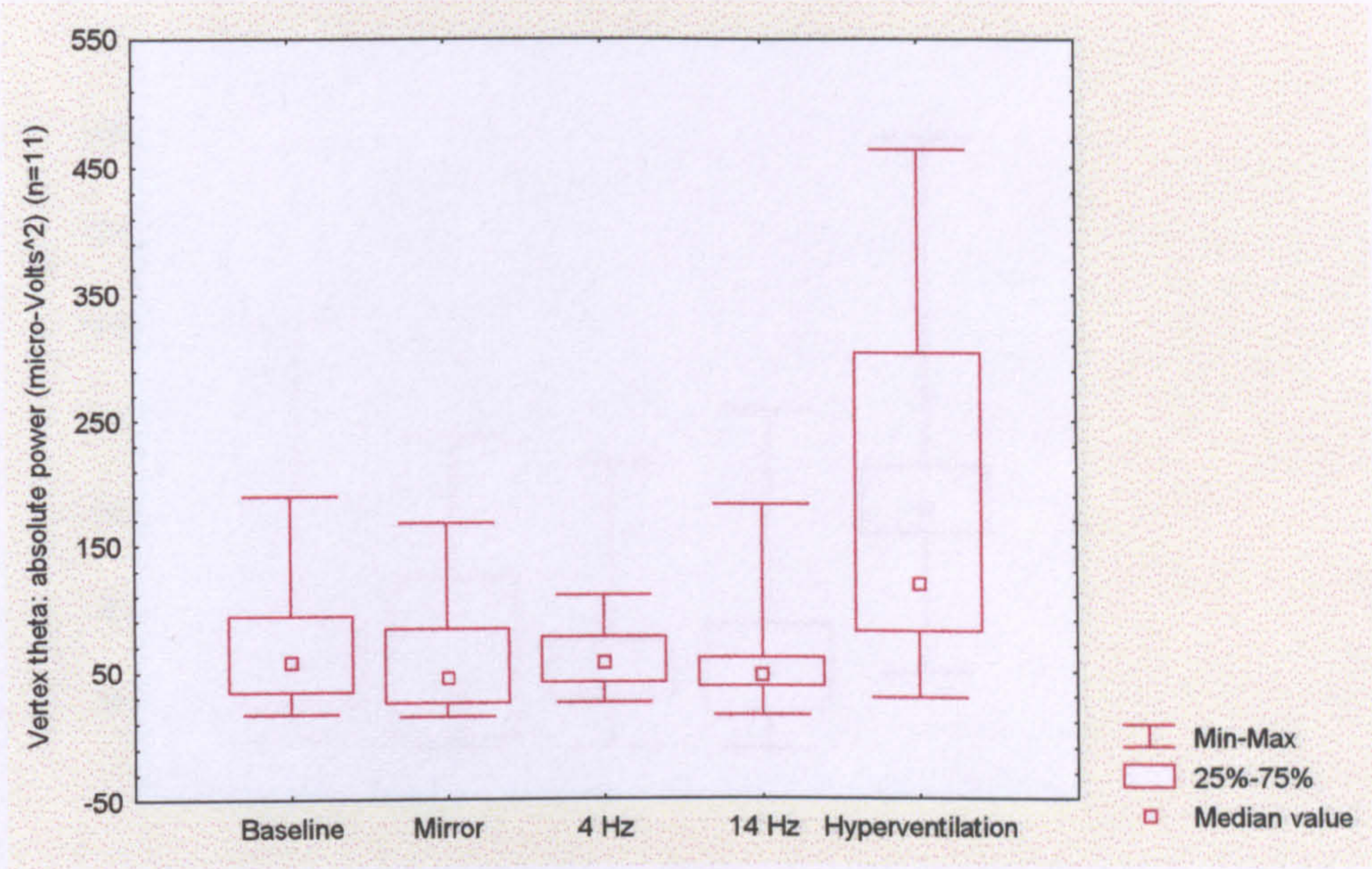
Friedman test

Ranks	
	Mean Rank
Delta baseline	3.18
Delta mirror	2.18
Delta 4 Hz	1.73
Delta 14 Hz	3.00
Delta hyperven tilation	4.91

Test Statistics <sup>a</sup>	
N	11
Chi-Square	26.255
df	4
Asymp. Sig.	<.01
a. Friedman Test	



Figure 9.2.2 Vertex theta power over 5 conditions



Friedman test

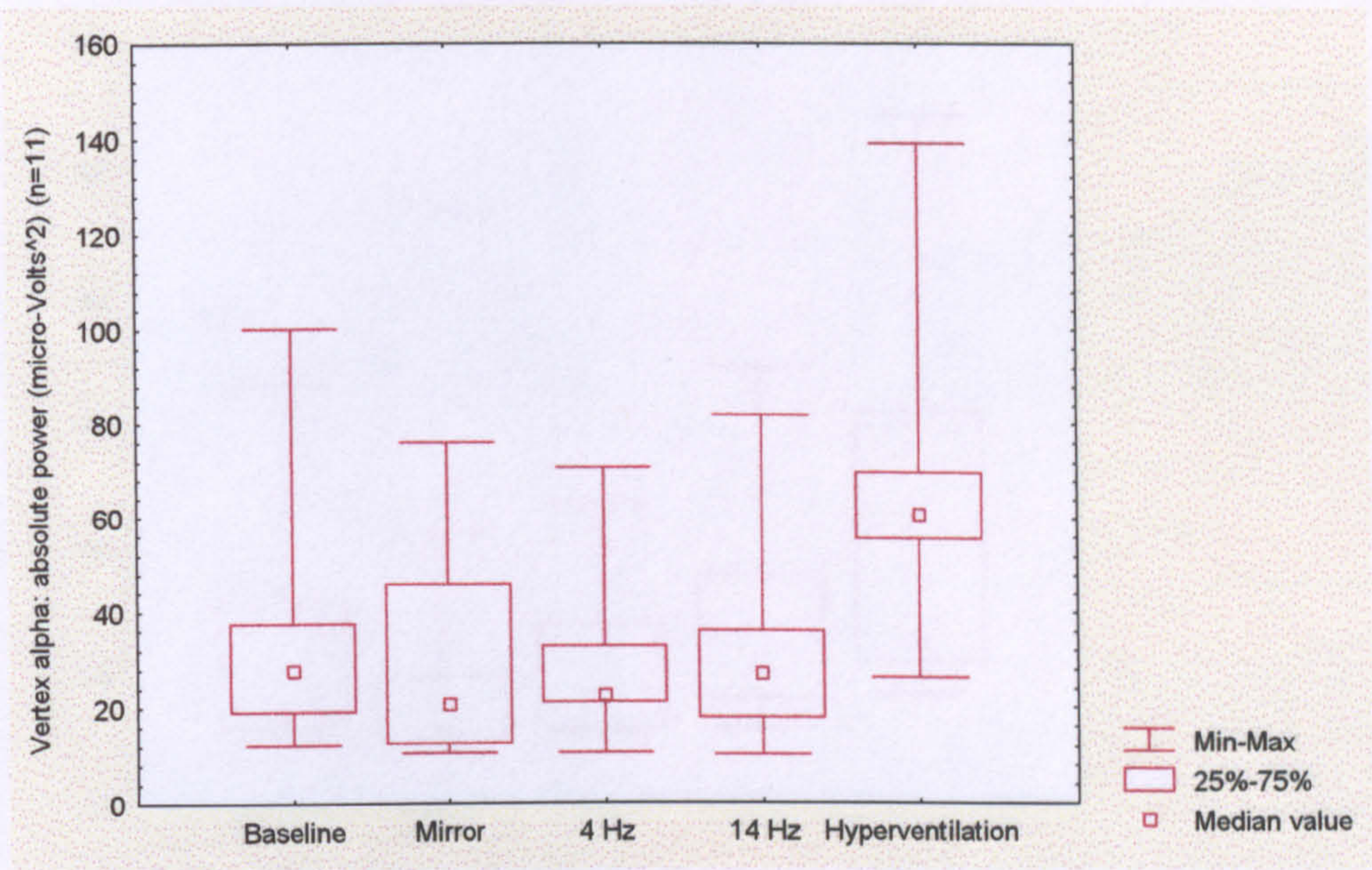
Ranks	
	Mean Rank
Theta baseline	3.27
Theta mirror	1.91
Theta 4 Hz	2.73
Theta 14 Hz	2.09
Theta hyperven tilation	5.00

Test Statistics <sup>a</sup>	
N	11
Chi-Square	27.127
df	4
Asymp. Sig.	<.01

a. Friedman Test



Figure 9.2.3 Vertex alpha power over 5 conditions



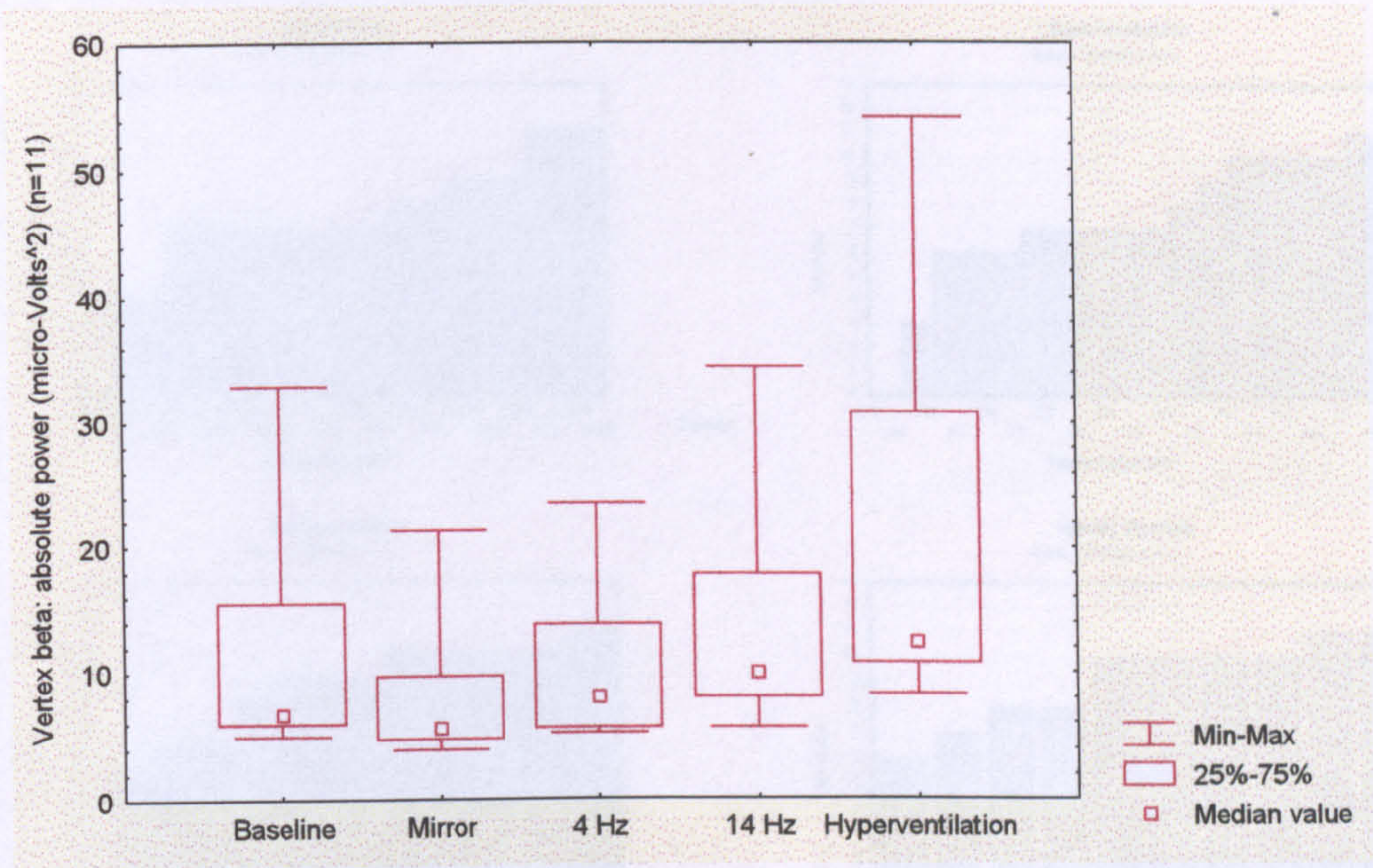
Friedman test

Ranks	
	Mean Rank
Alpha baseline	3.18
Alpha mirror	2.23
Alpha 4 Hz	2.41
Alpha 14 Hz	2.27
Alpha hyperven tilation	4.91

Test Statistics <sup>a</sup>	
N	11
Chi-Square	22.776
df	4
Asymp. Sig.	<.01
a. Friedman Test	



Figure 9.2.4 Vertex beta power over 5 conditions



Friedman test

Ranks	
	Mean Rank
Beta baseline	3.00
Beta mirror	1.36
Beta 4 Hz	2.36
Beta 14 Hz	3.73
Beta hyperven tilation	4.55

Test Statistics <sup>a</sup>	
N	11
Chi-Square	26.400
df	4
Asymp. Sig.	<.01
a. Friedman Test	



Figure 9.3.1 Distribution fitting to SSD variables

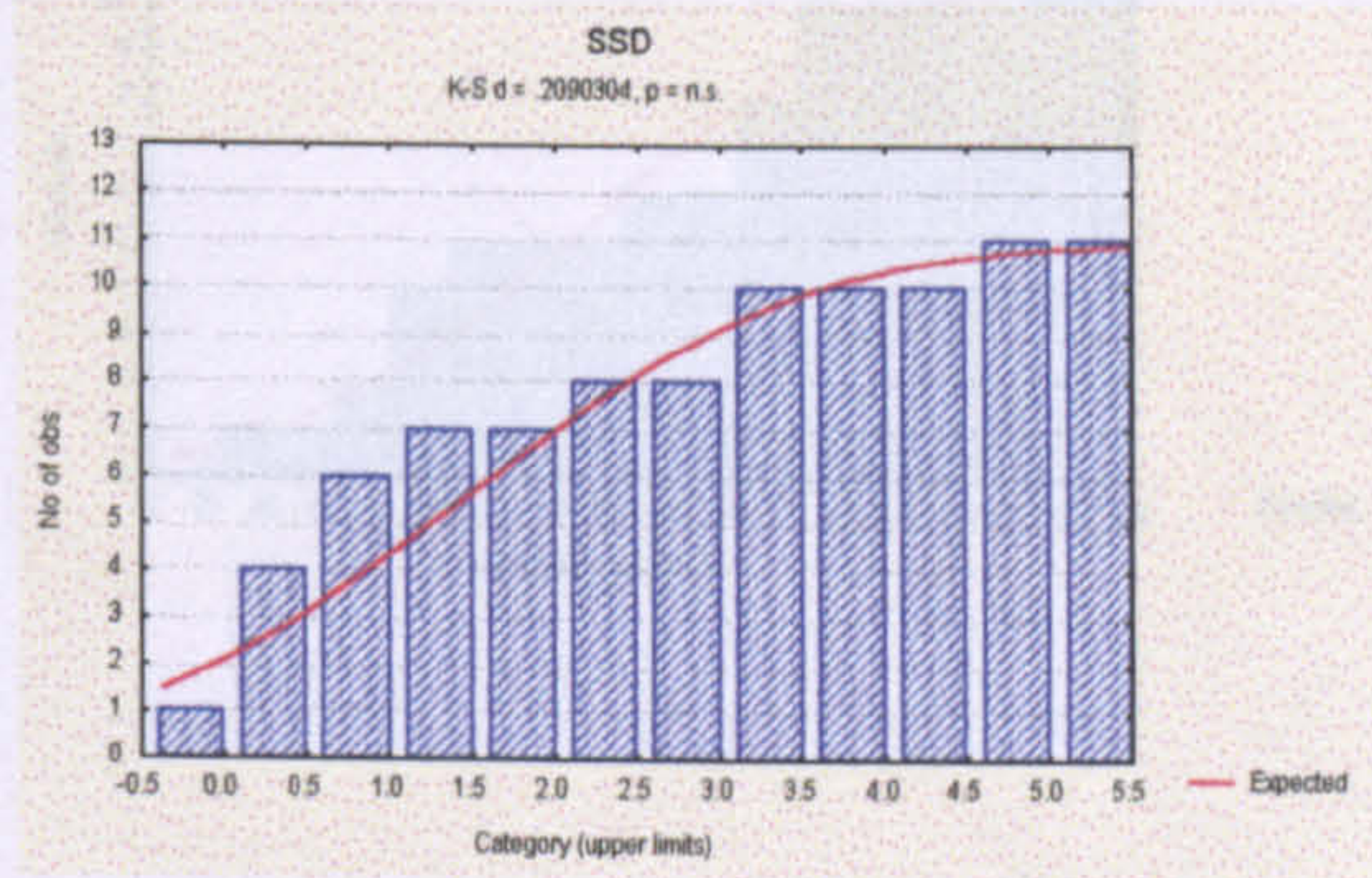
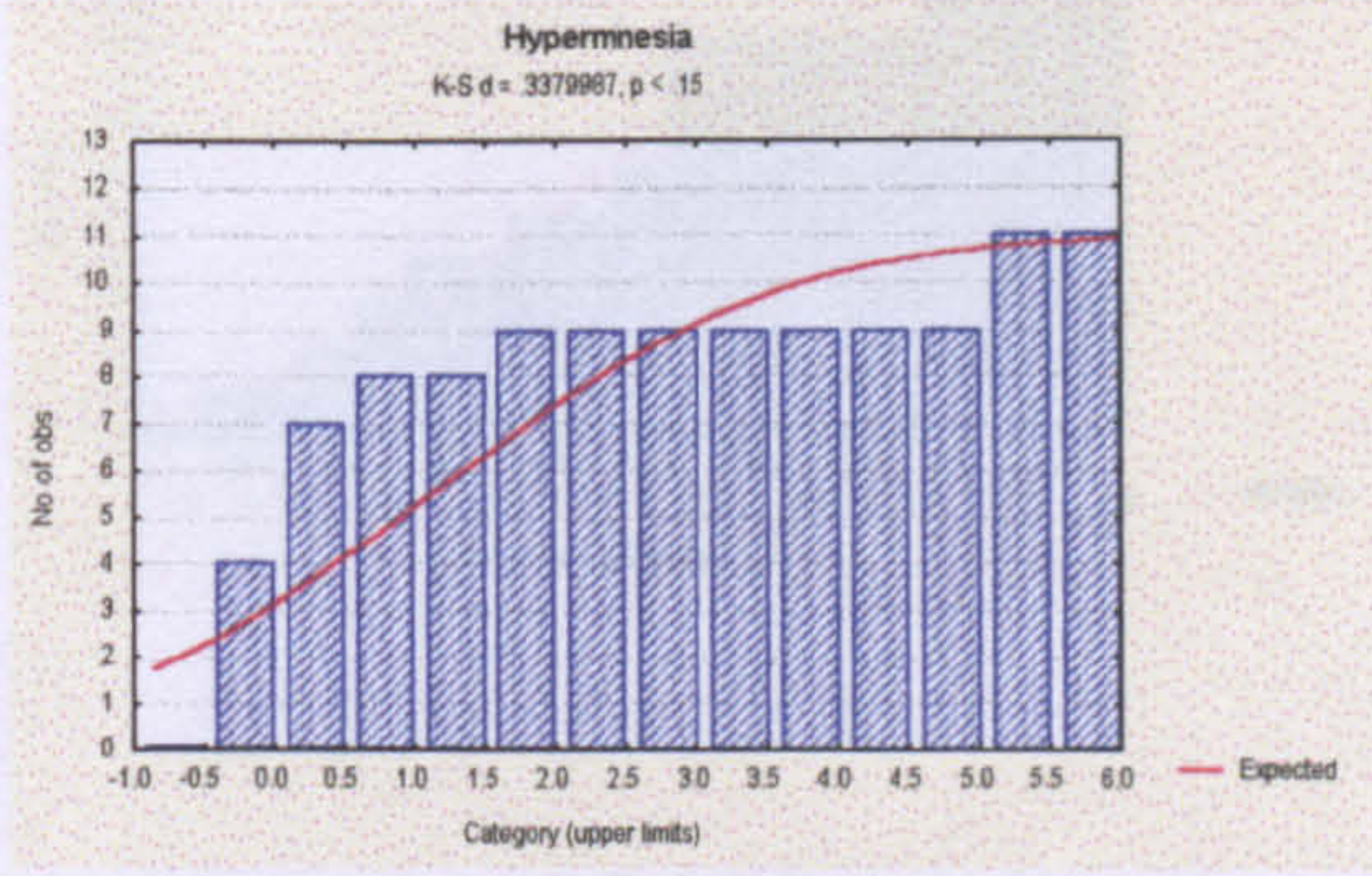
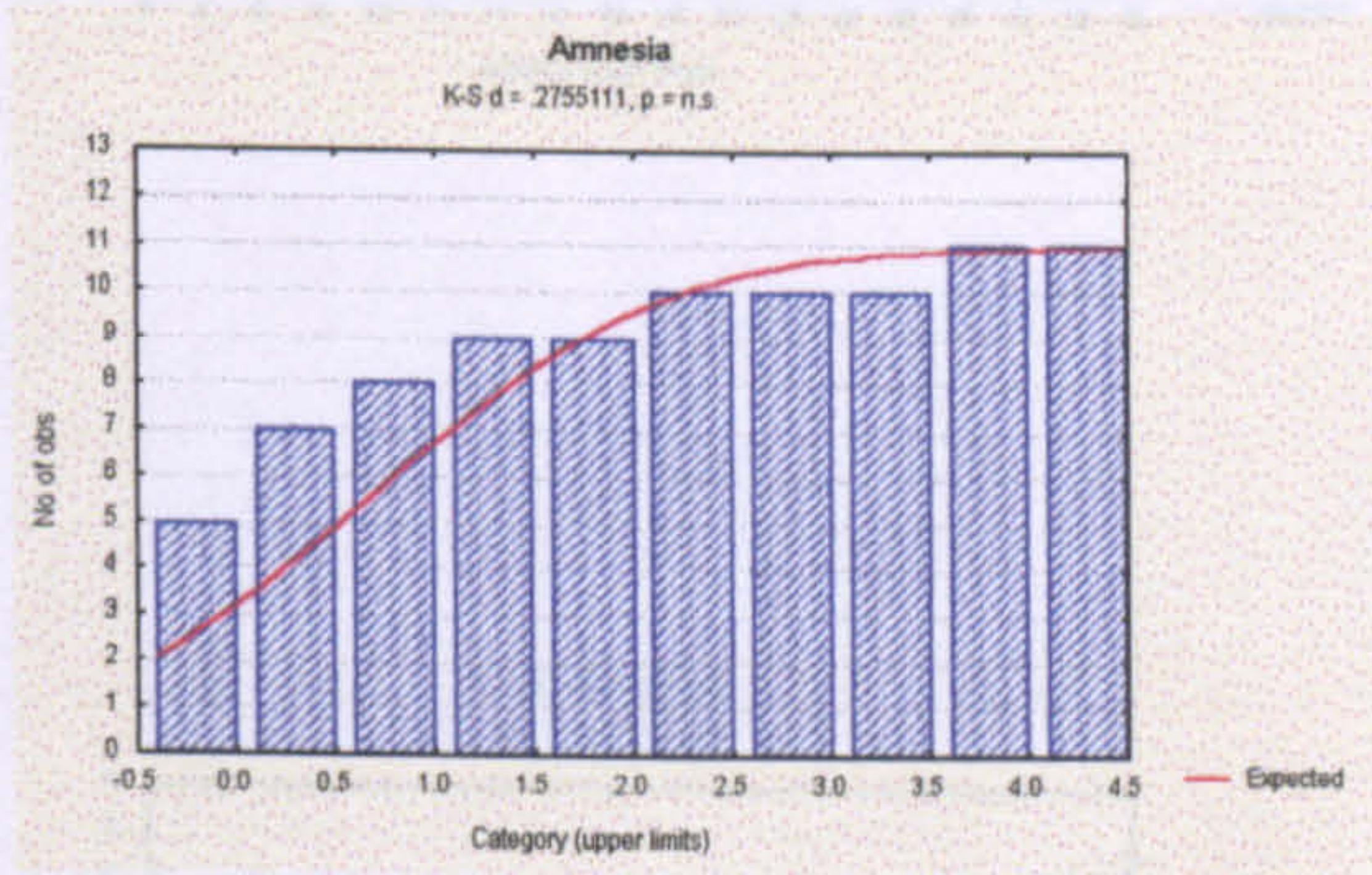
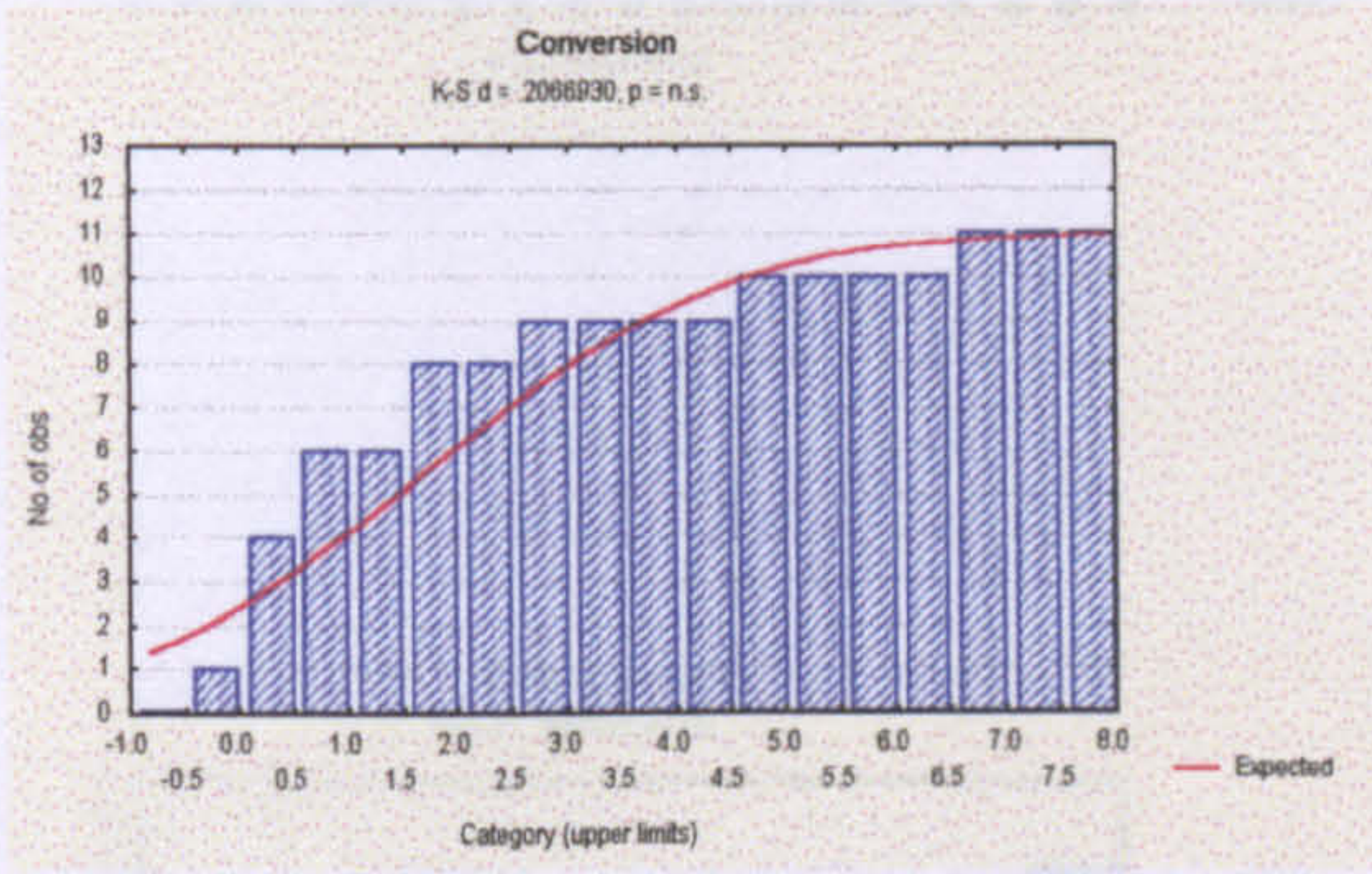
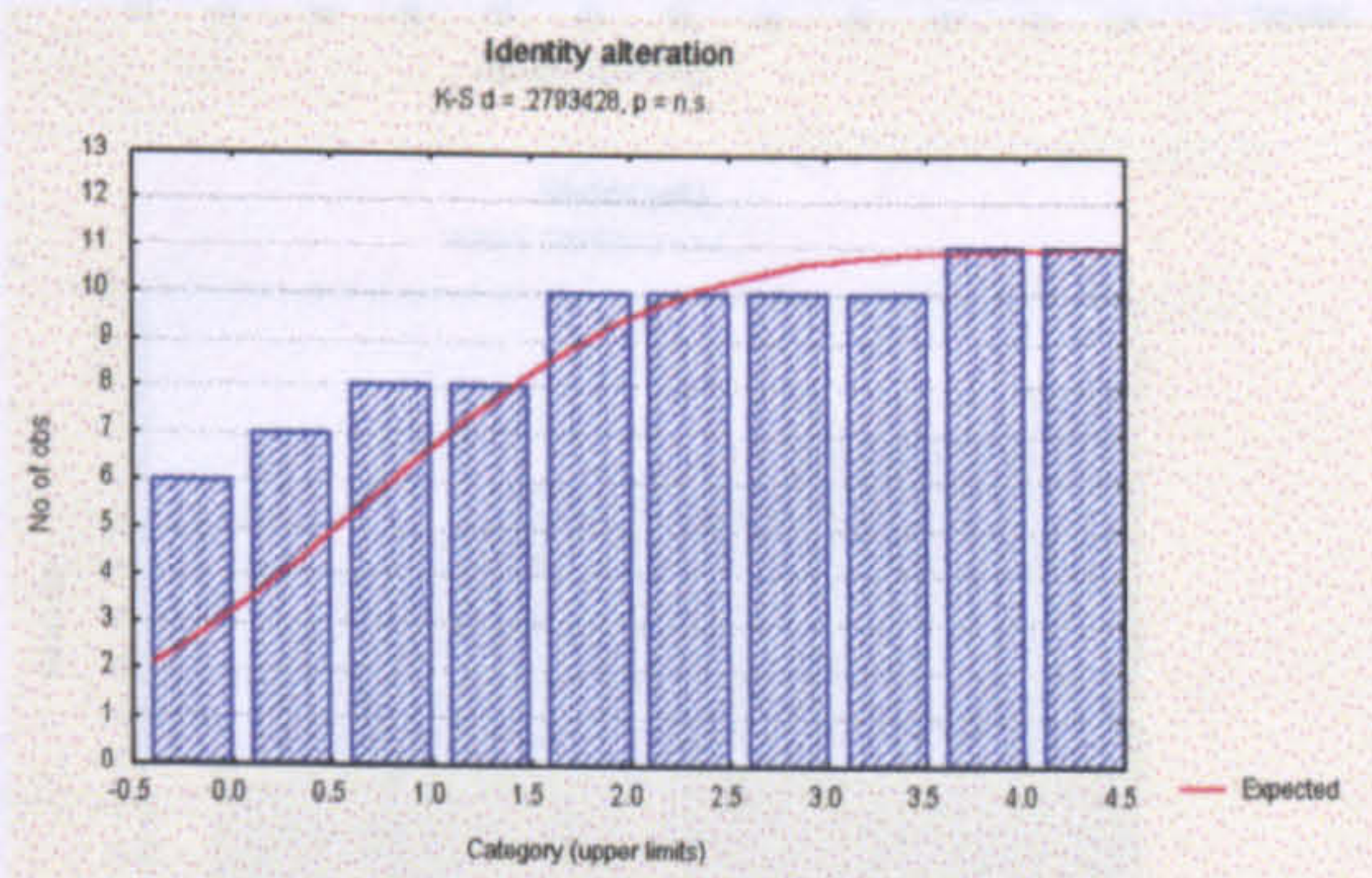
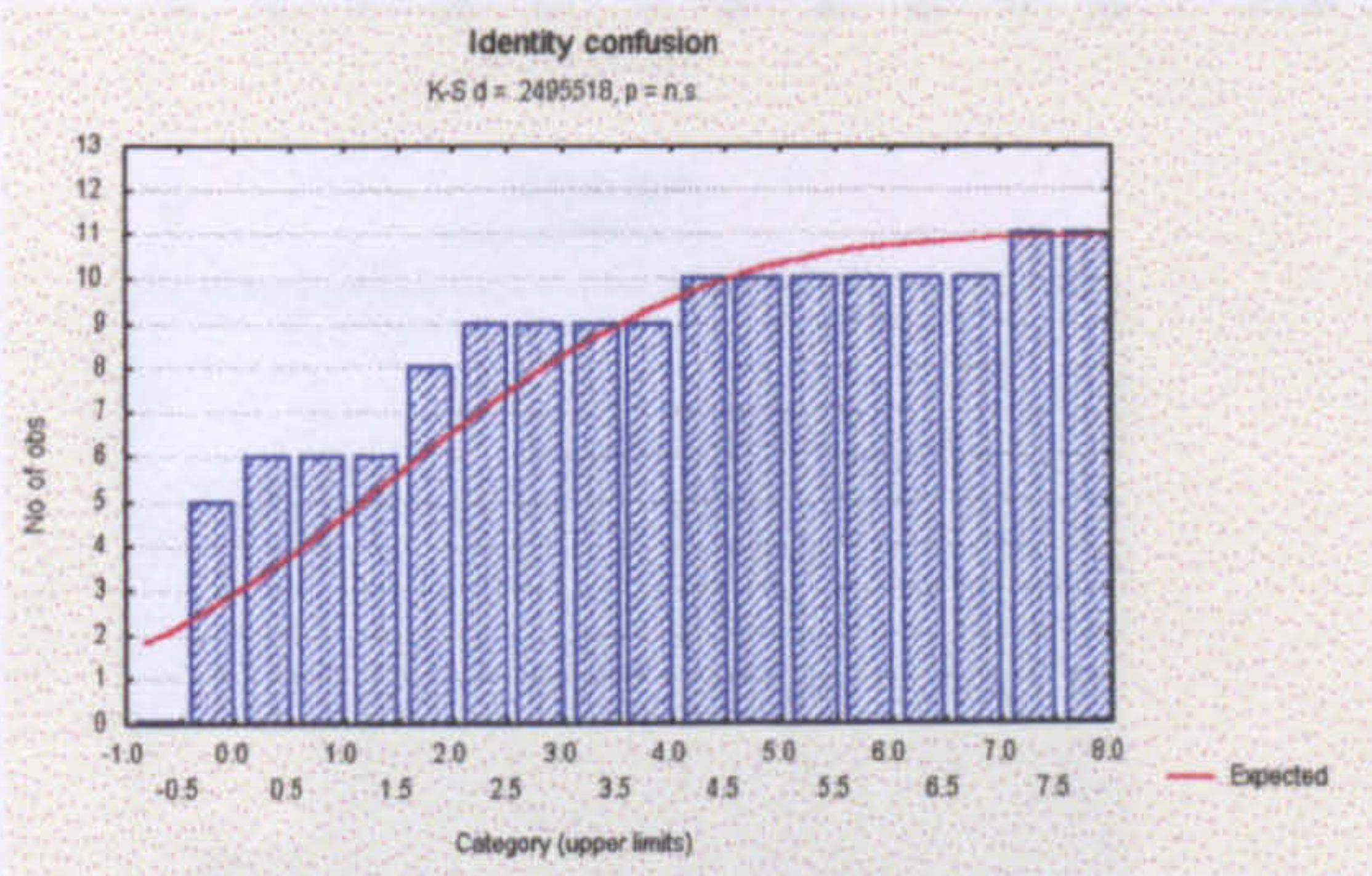
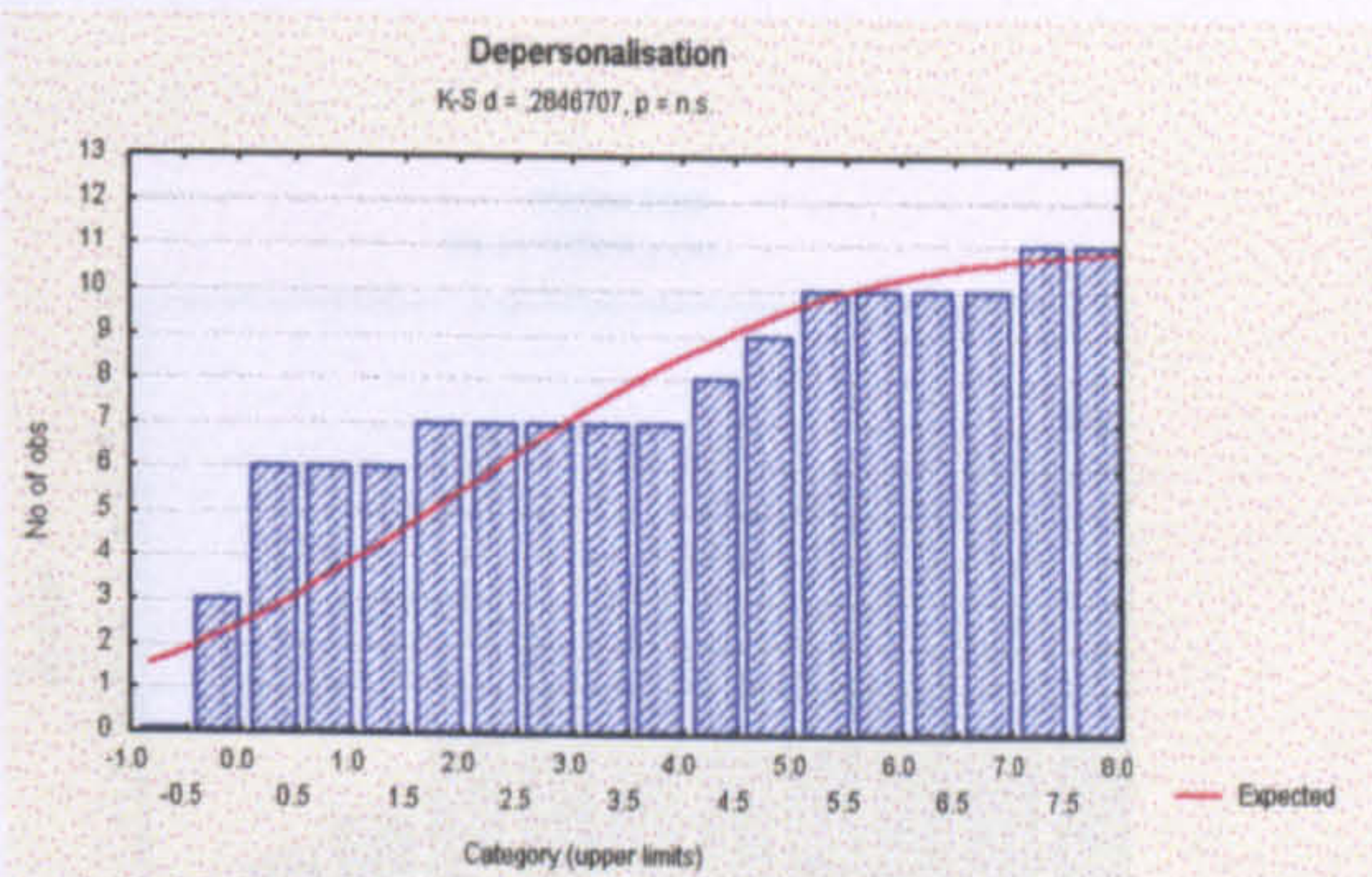
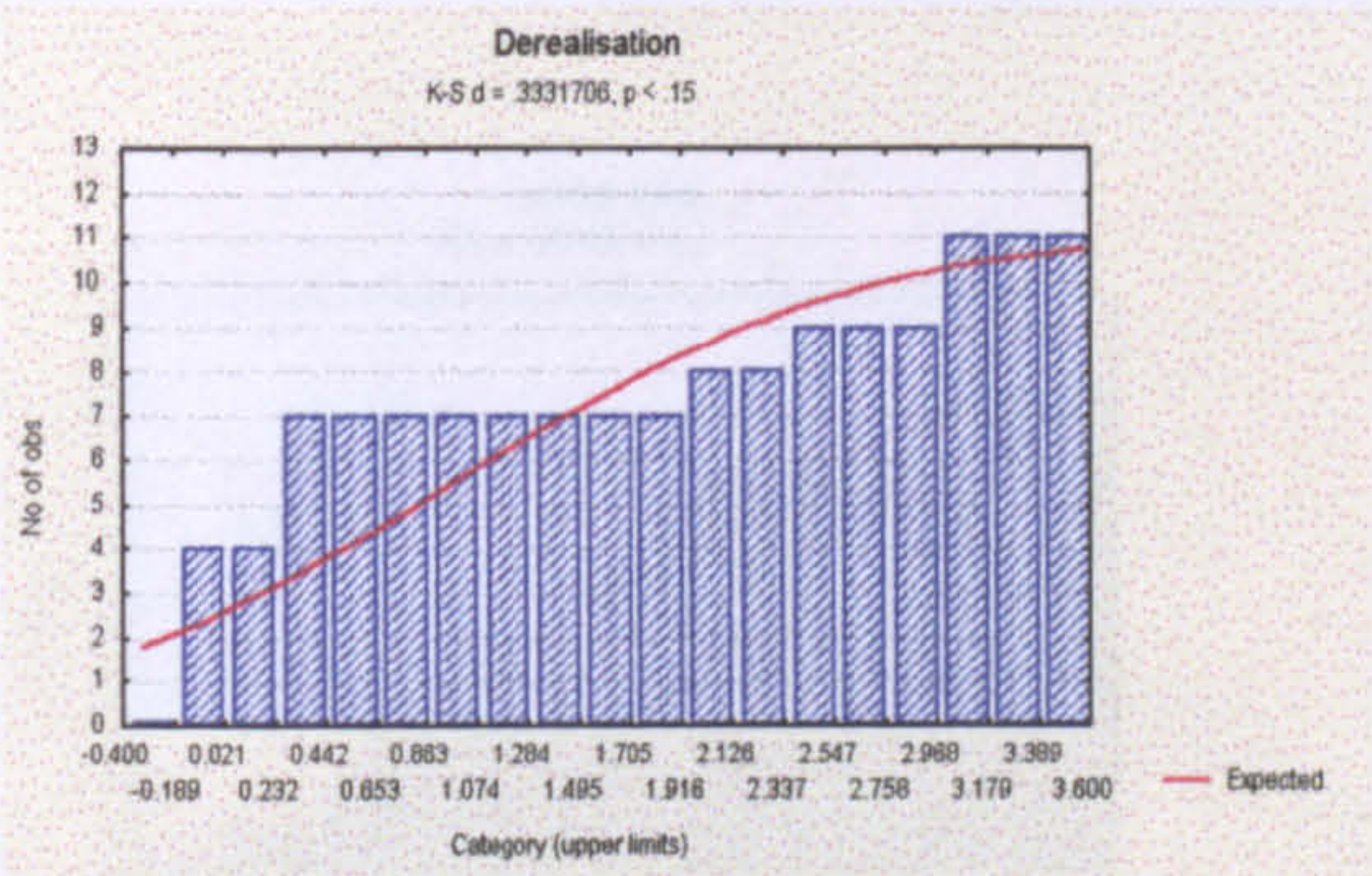




Figure 9.3.2 Distribution fitting to EEG variables

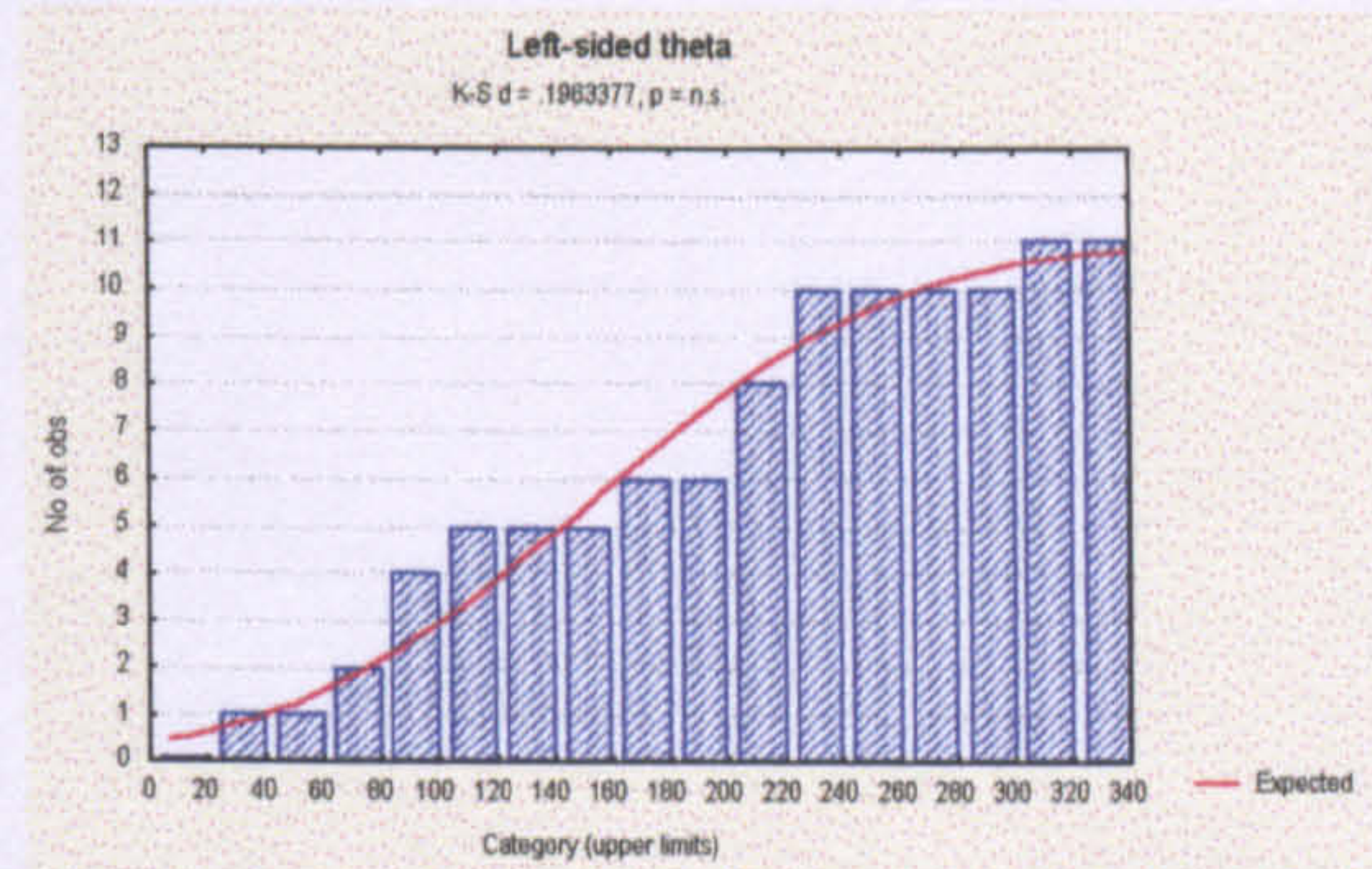
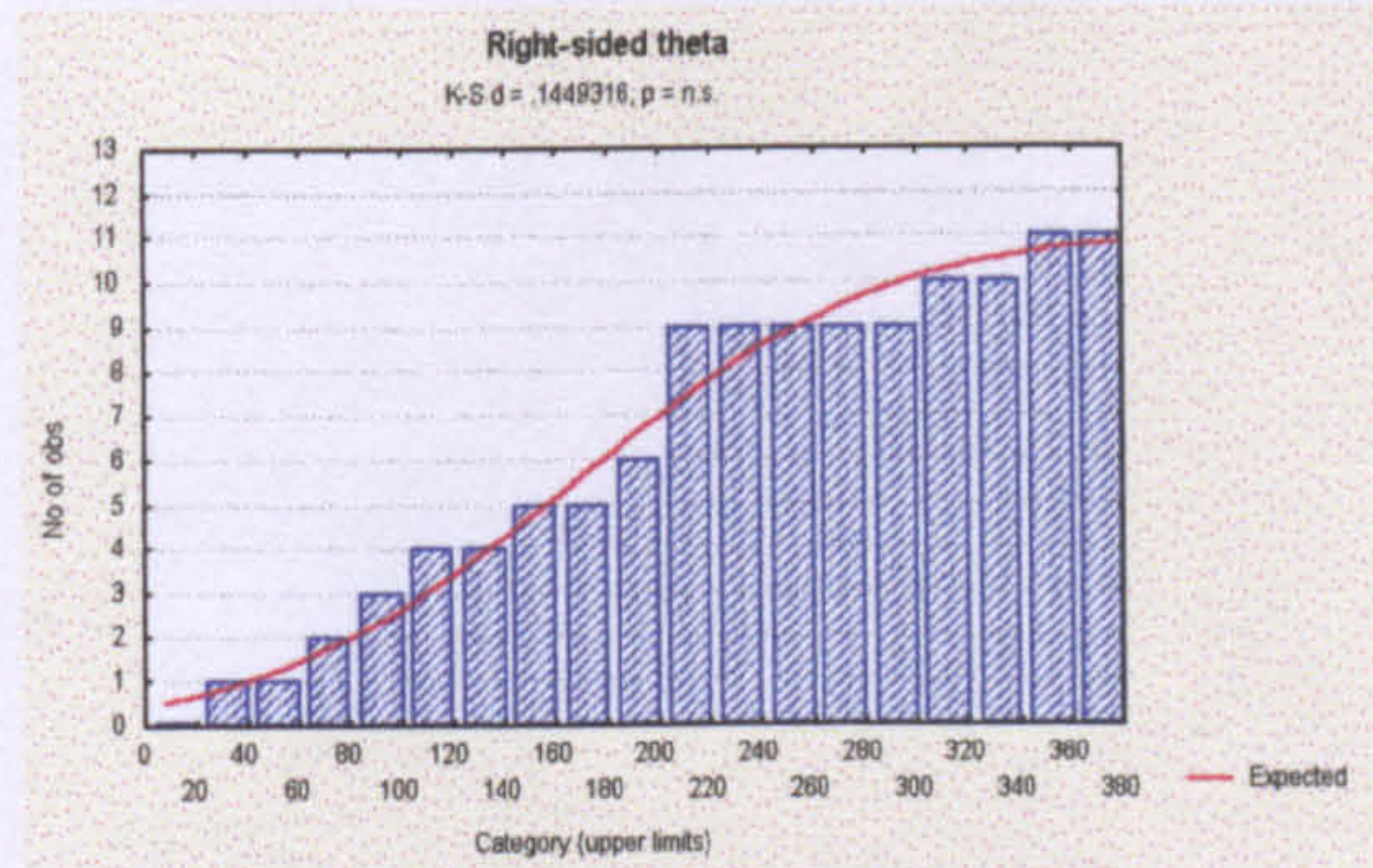
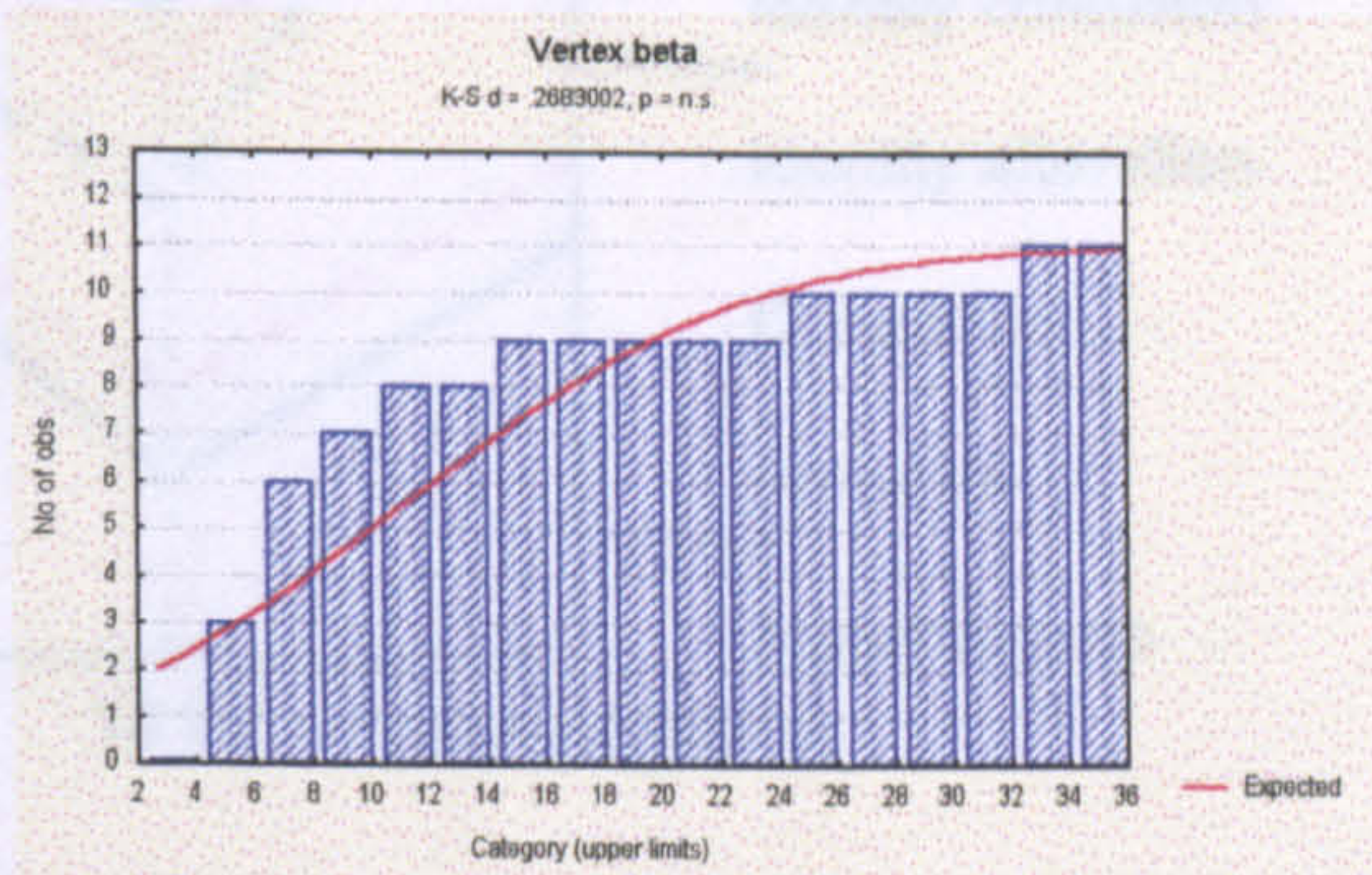
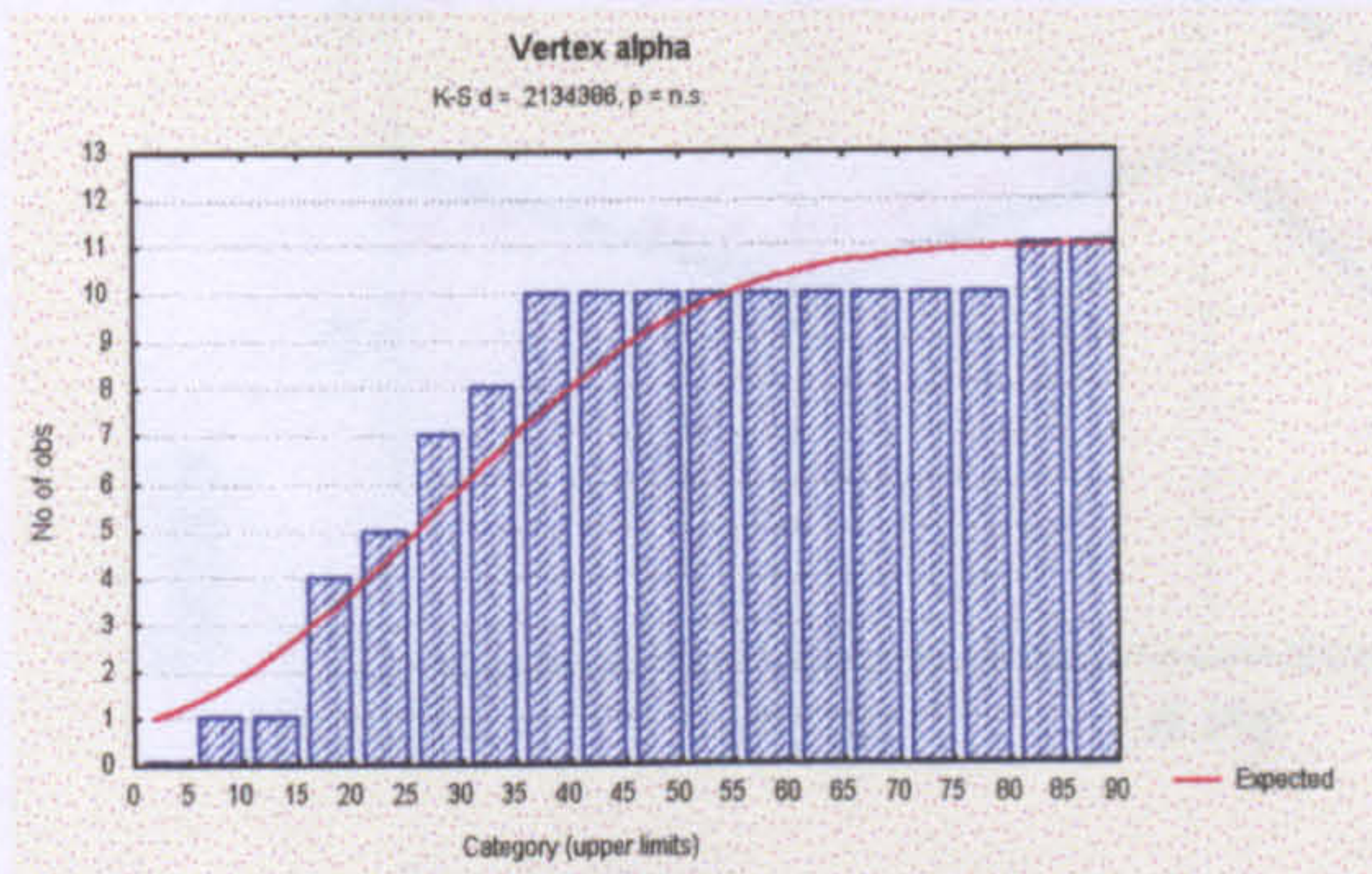
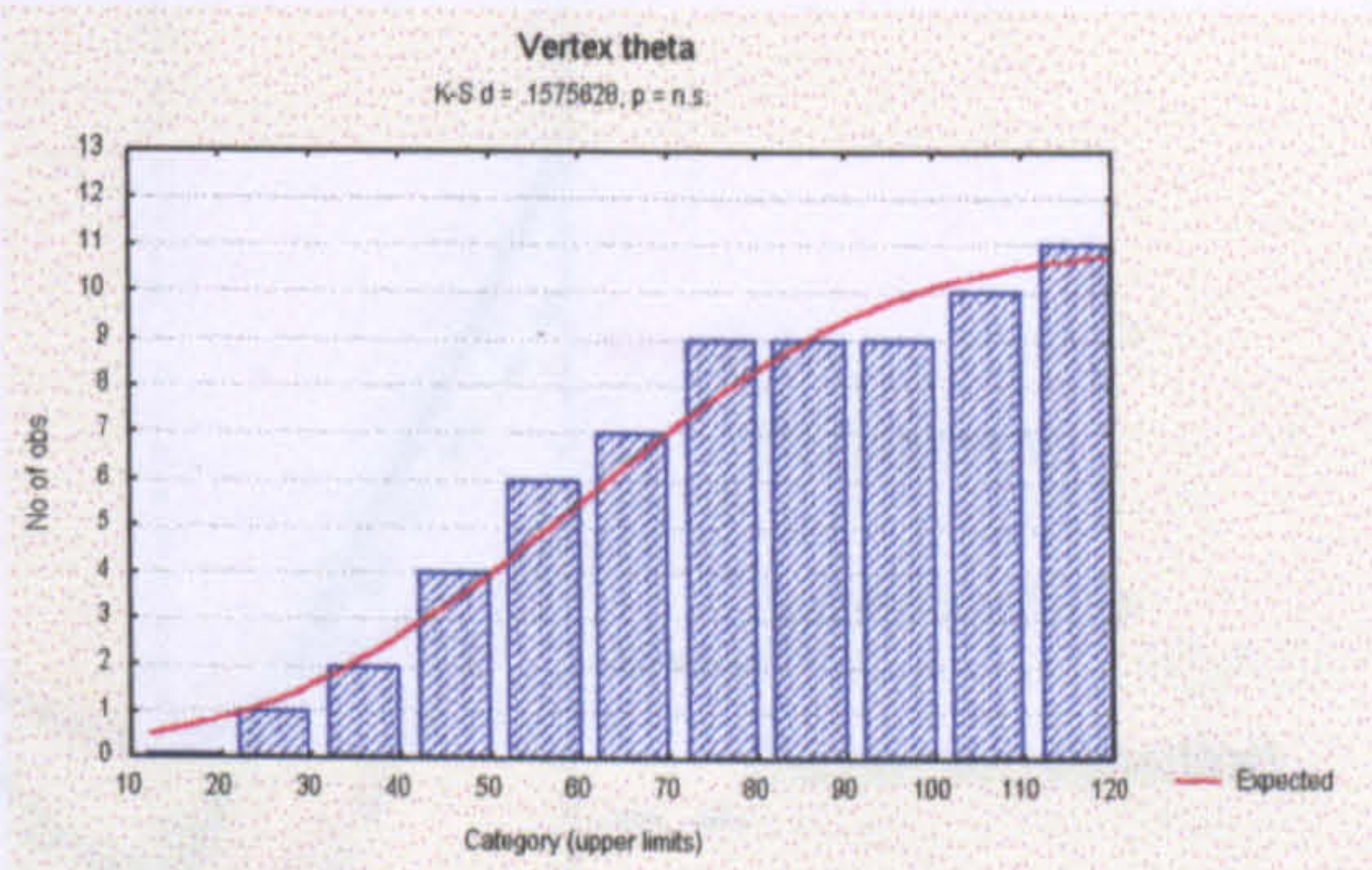
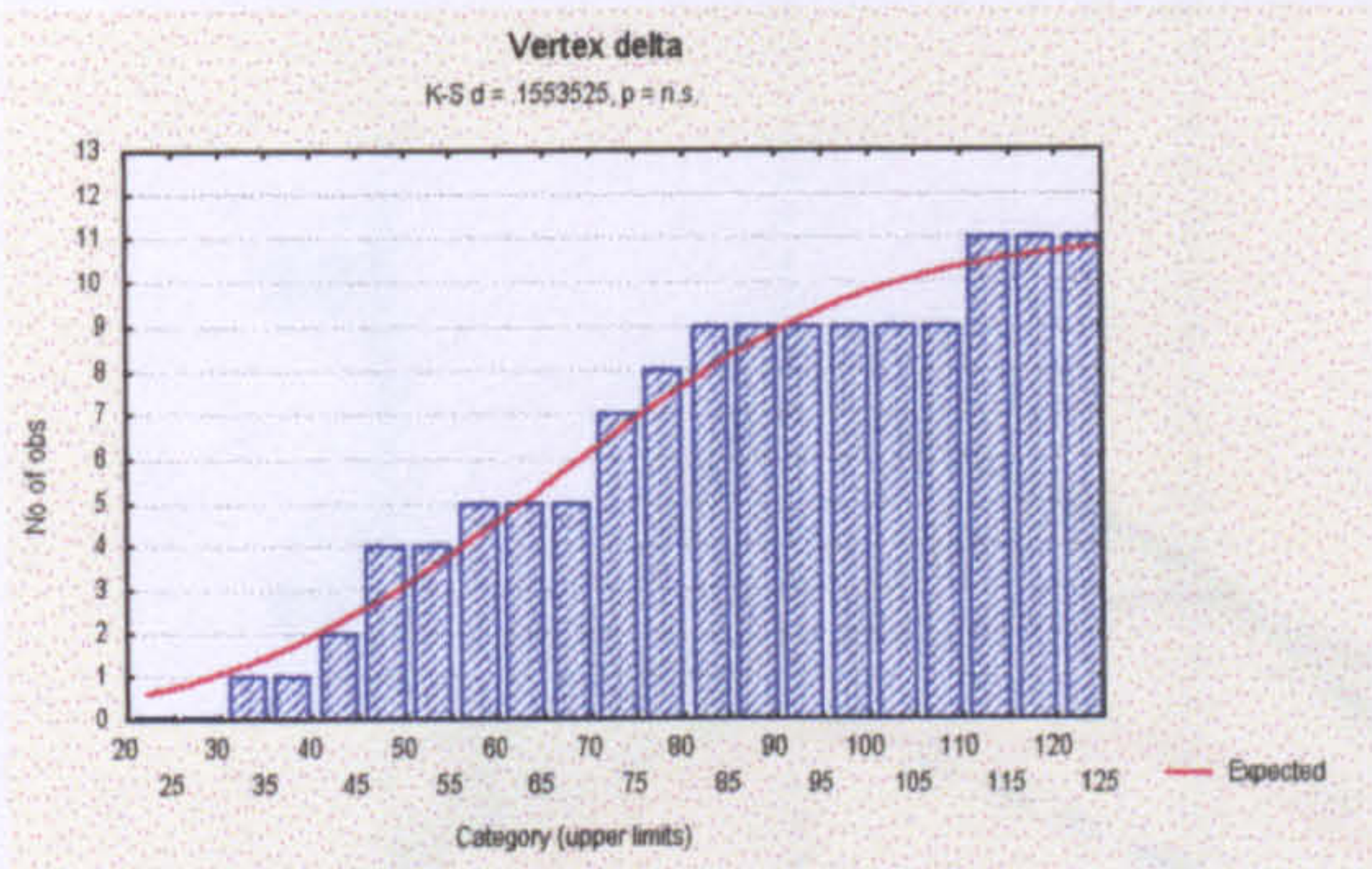




Figure 9.4.1 Mean SSD and subscale scores over 5 conditions

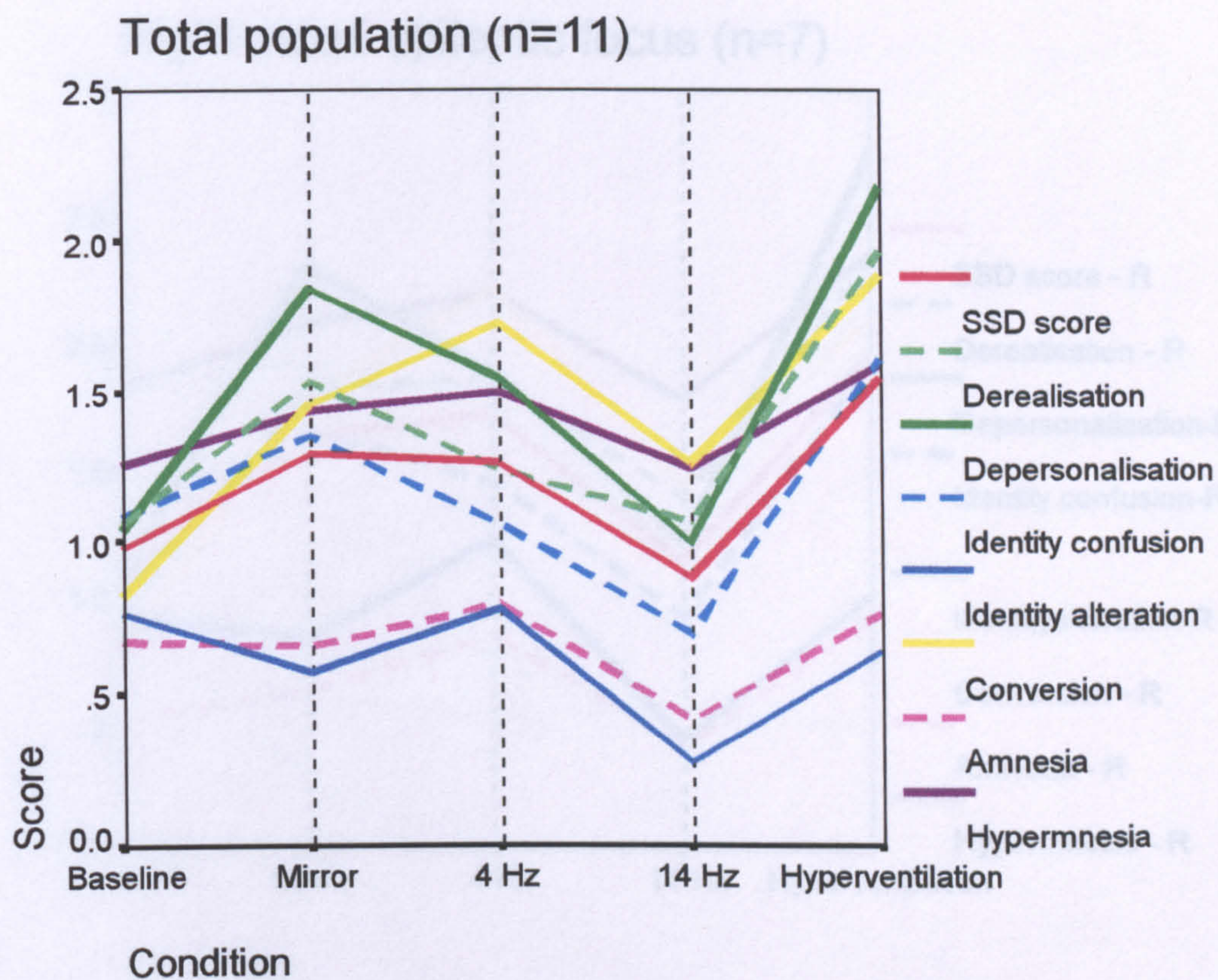
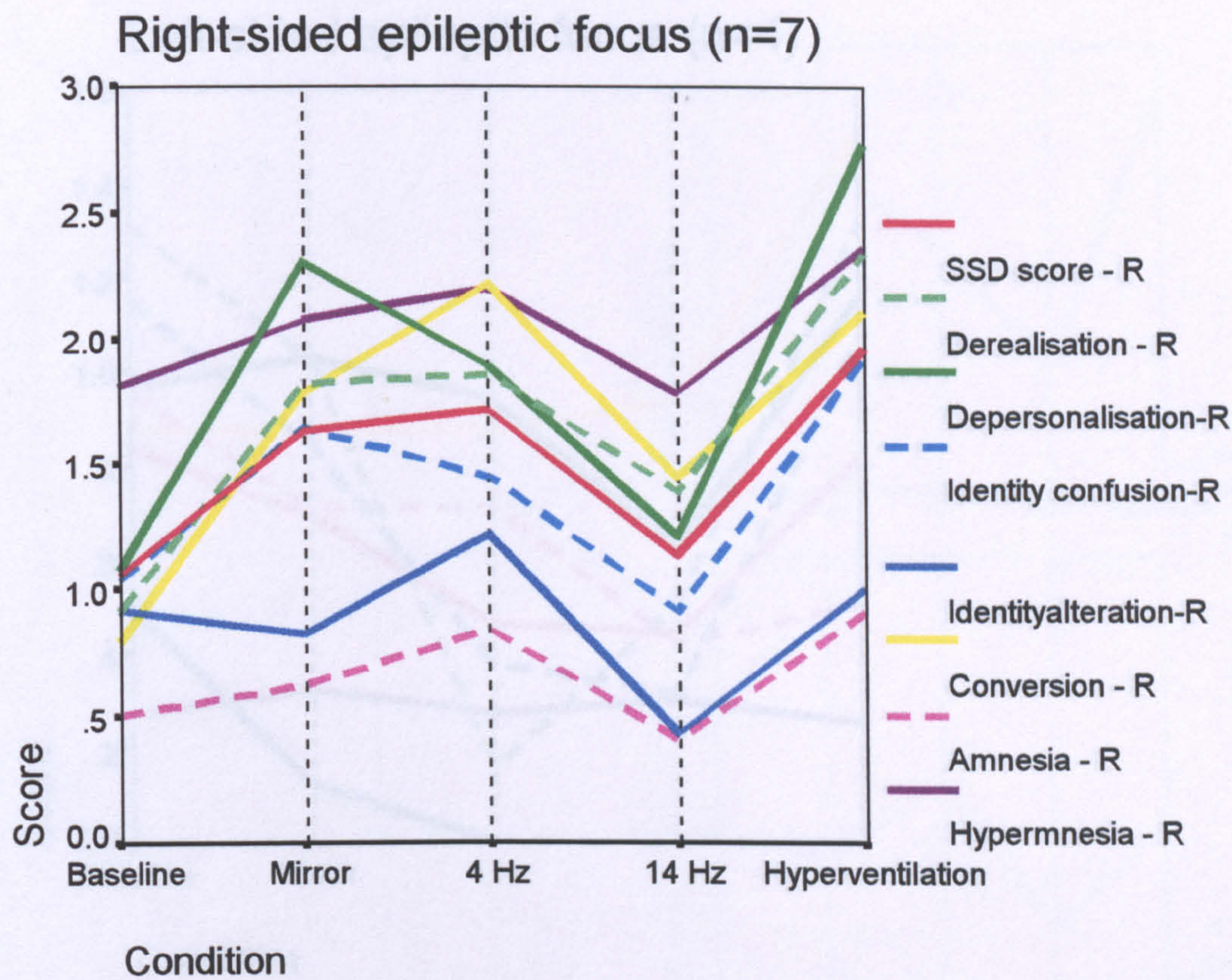


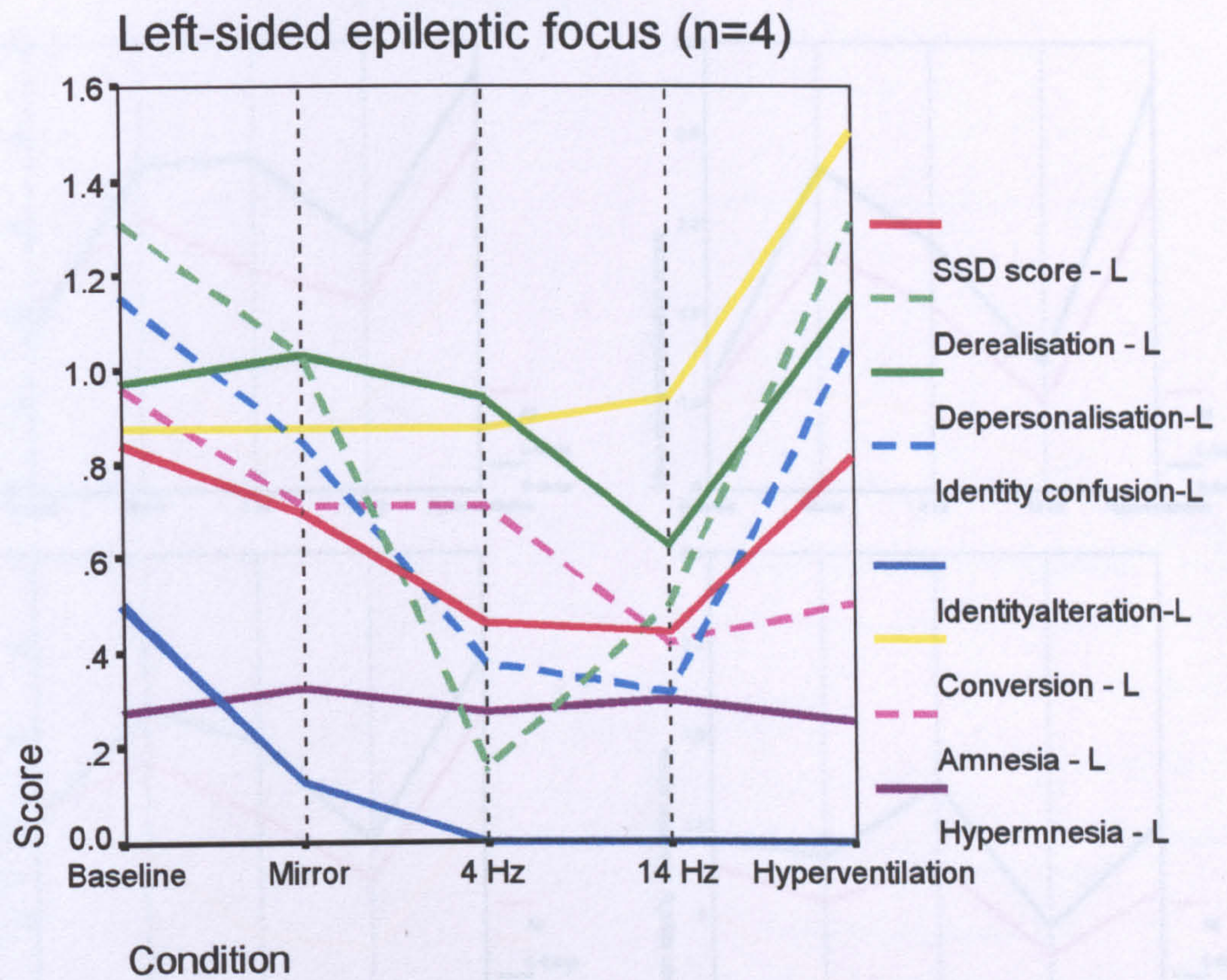


Figure 9.4.2 Mean SSD and subscale scores over 5 conditions



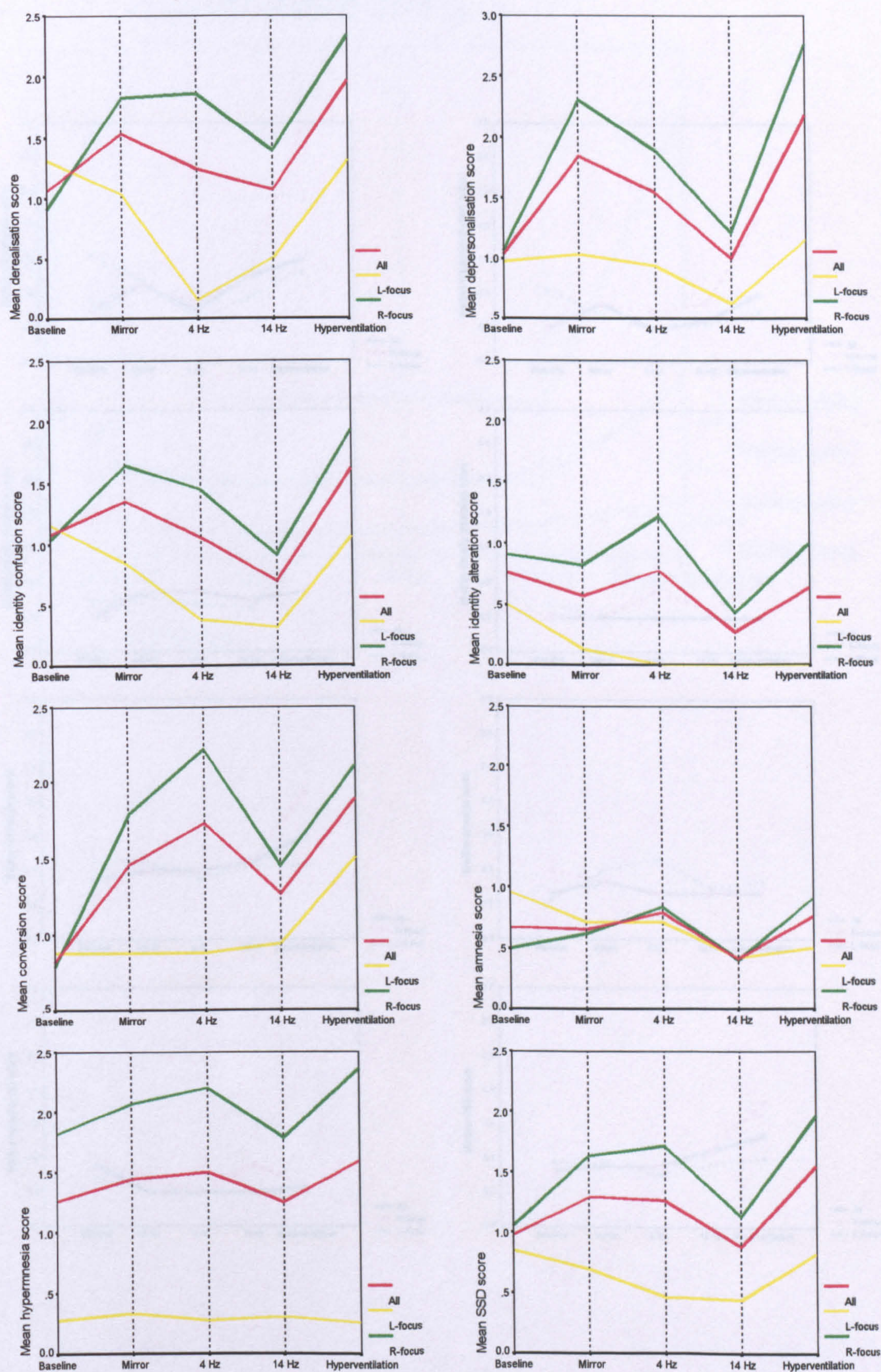


**Figure 9.4.3** Mean SSD and subscale scores over 5 conditions





**Figure 9.4.4** Mean SSD and subscale scores:  
Comparing patients with right-sided (n=7) and left-sided (n=4) epileptic foci





**Figure 9.4.5** Median SSD and subscale scores:  
Comparing patients with right-sided (n=7) and left-sided (n=4) epileptic foci

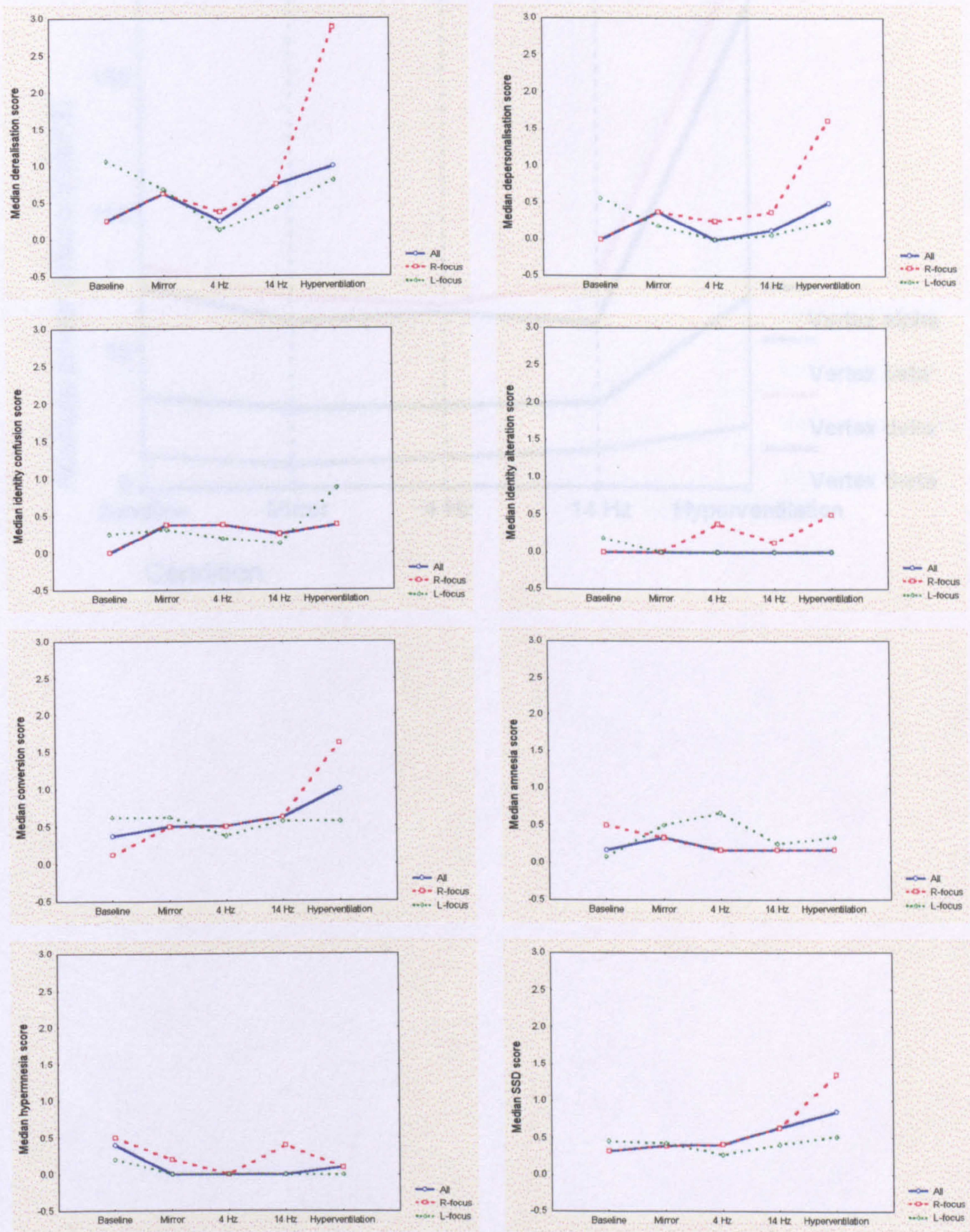




Figure 9.5.1 Mean EEG vertex power over 5 conditions

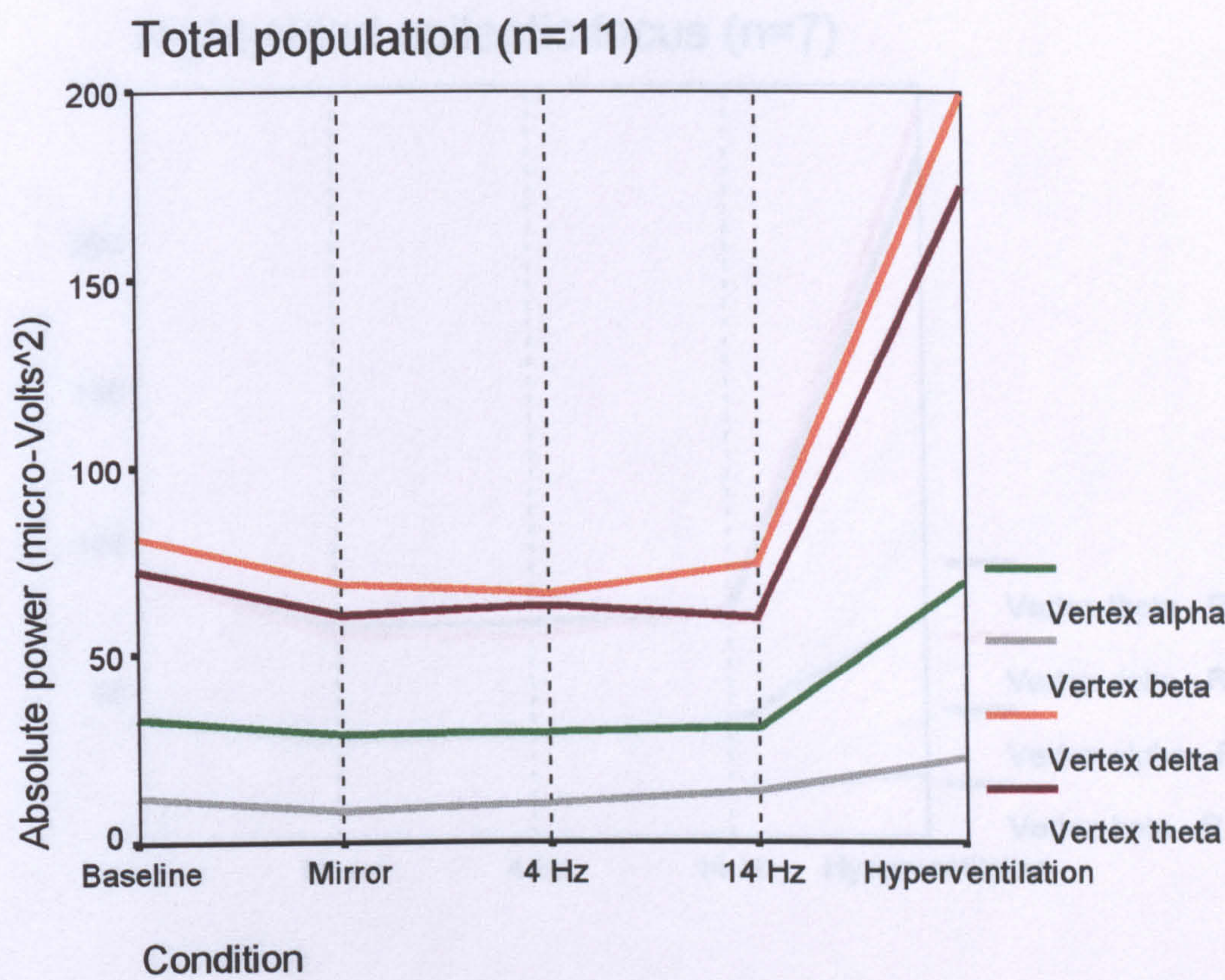




Figure 9.5.2 Mean EEG vertex power over 5 conditions

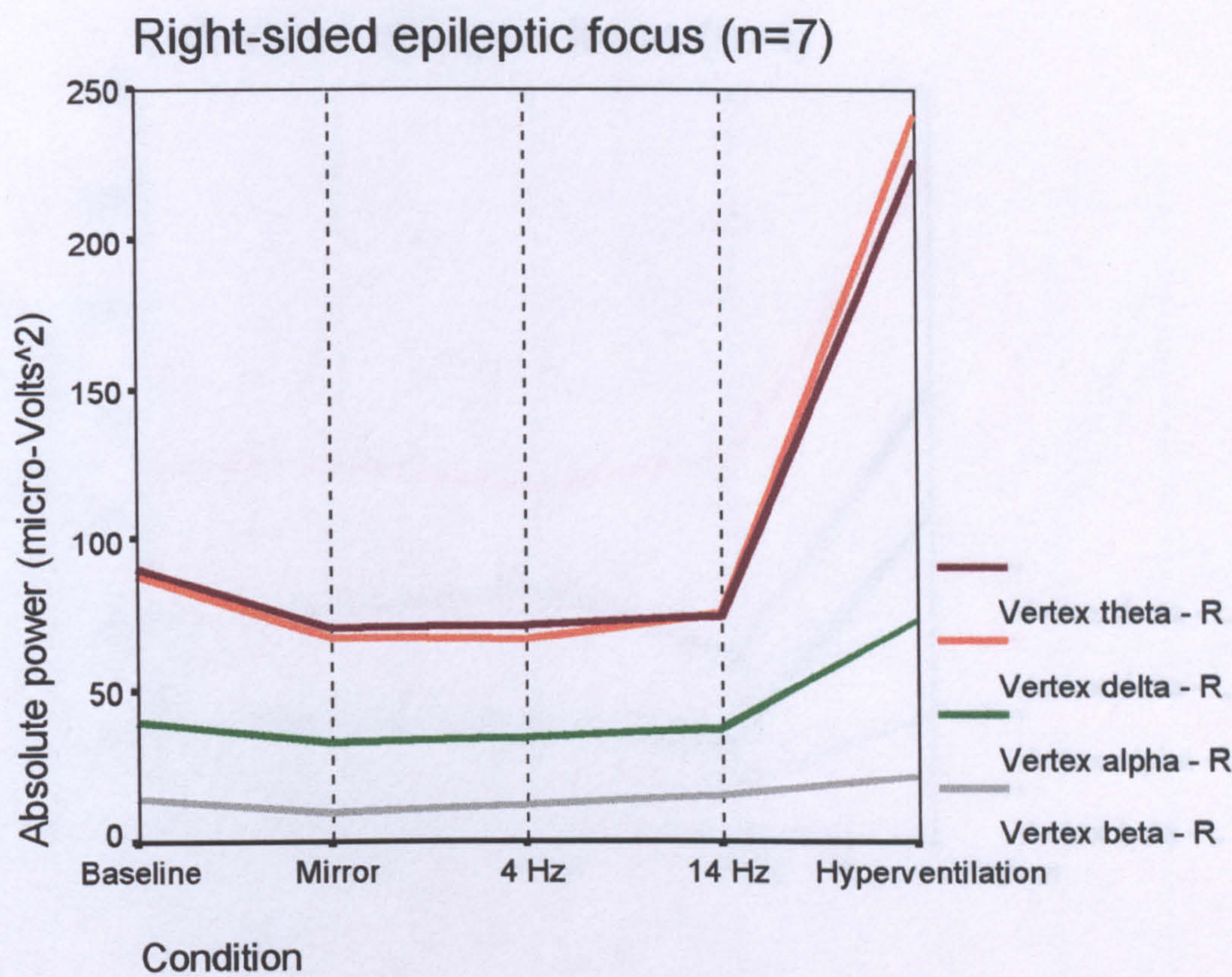
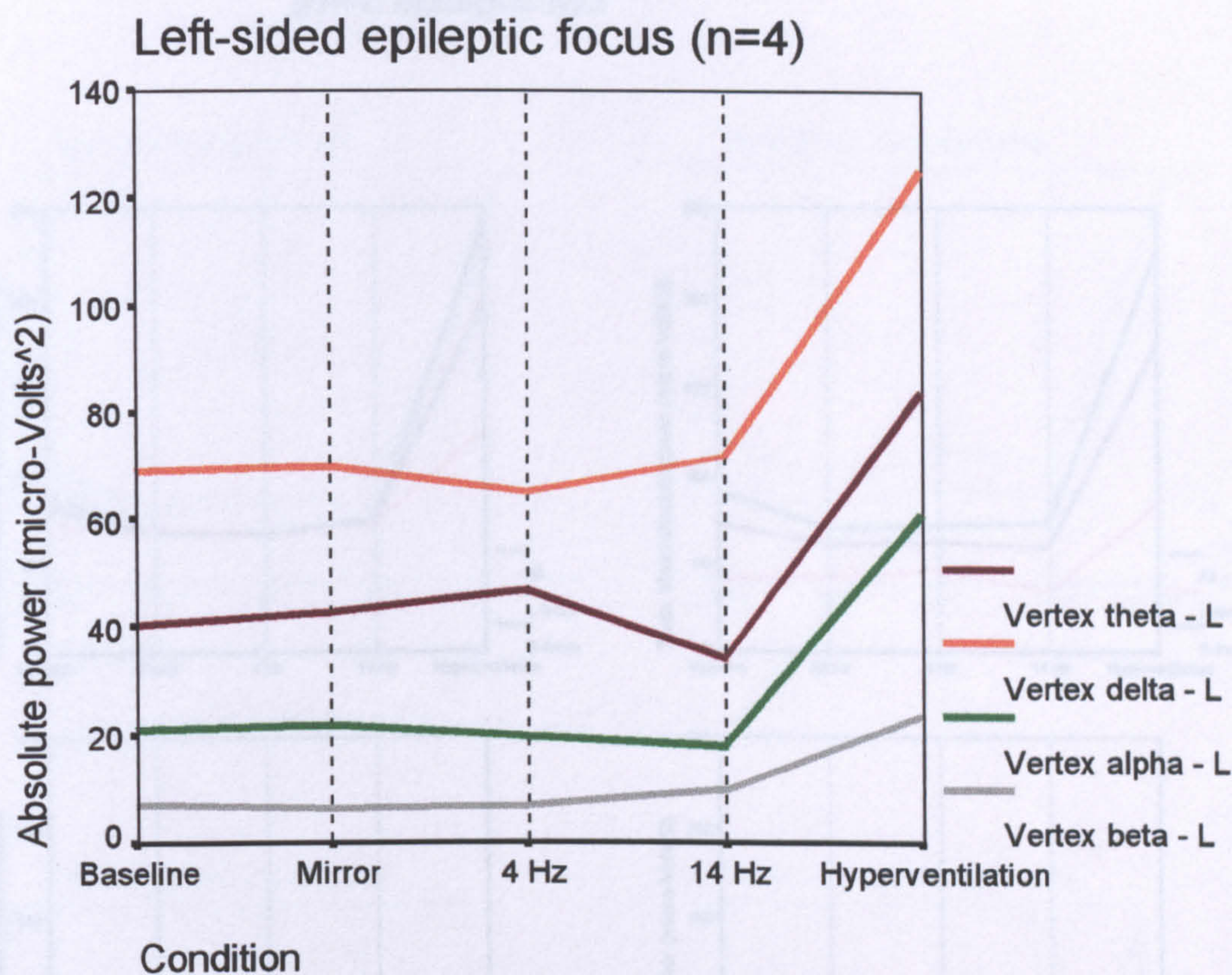


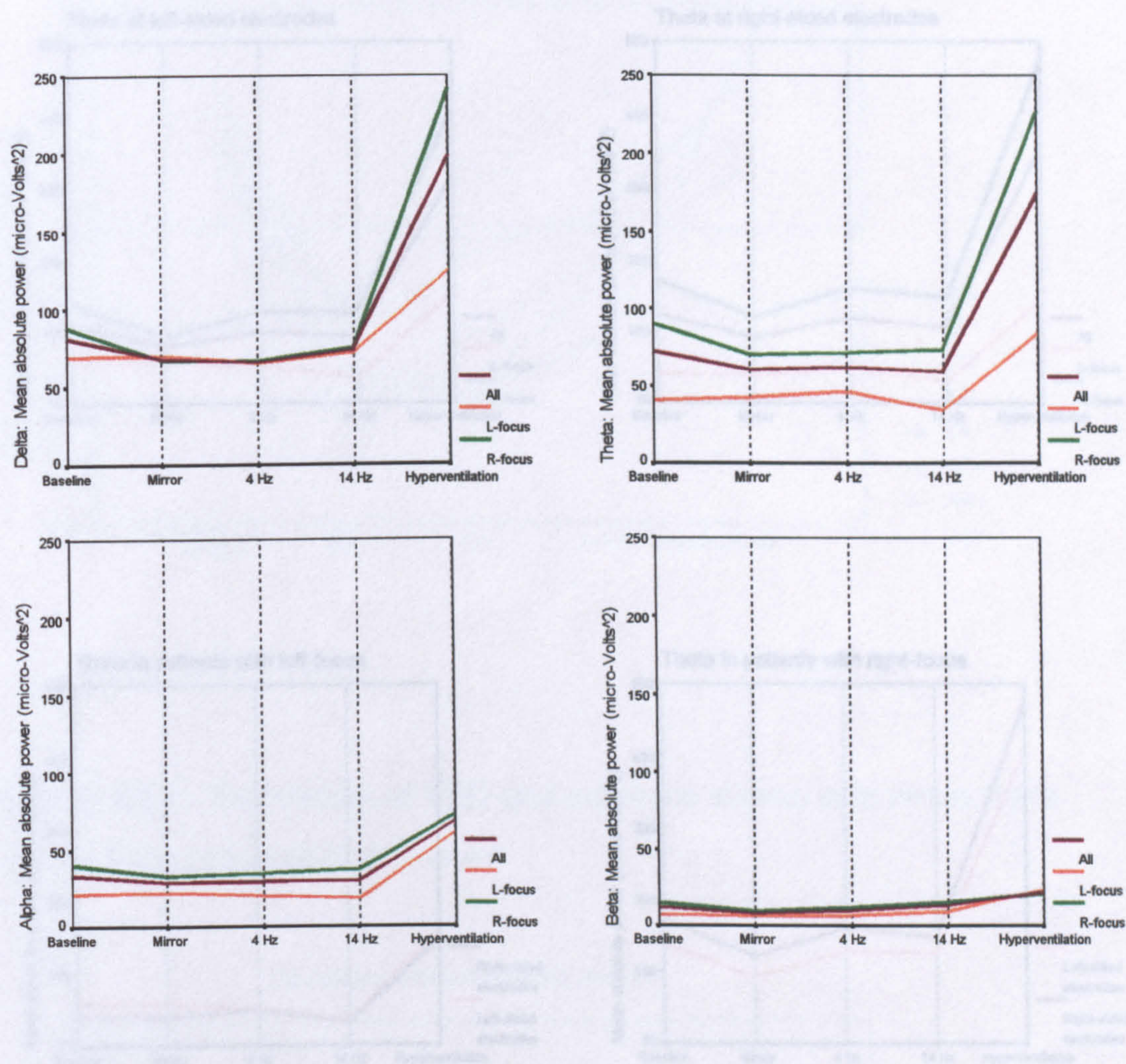


Figure 9.5.3 Mean EEG vertex power over 5 conditions



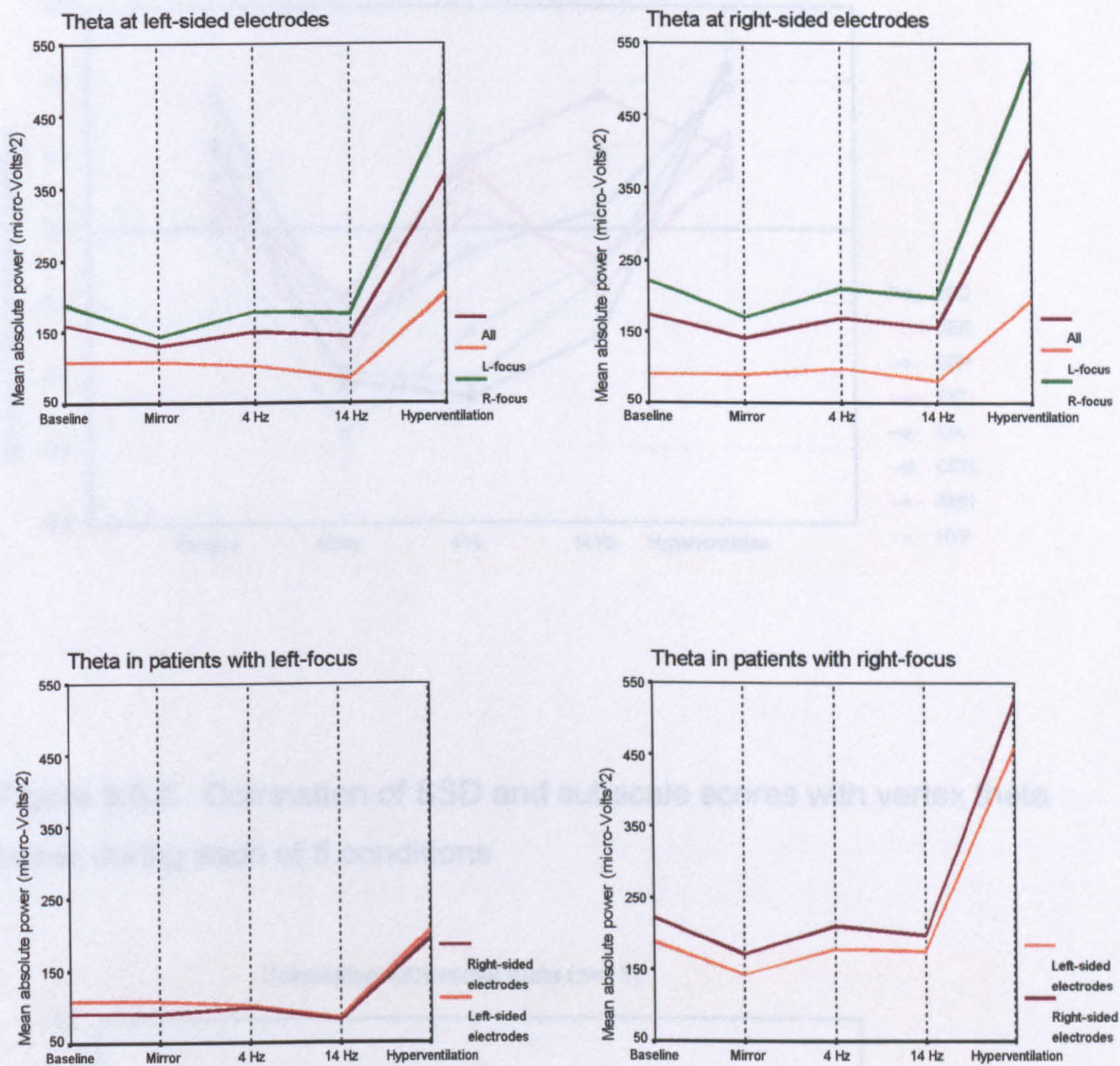


**Figure 9.5.4** Mean EEG vertex power:  
Comparing patients with right-sided (n=7) and left-sided (n=4) epileptic foci



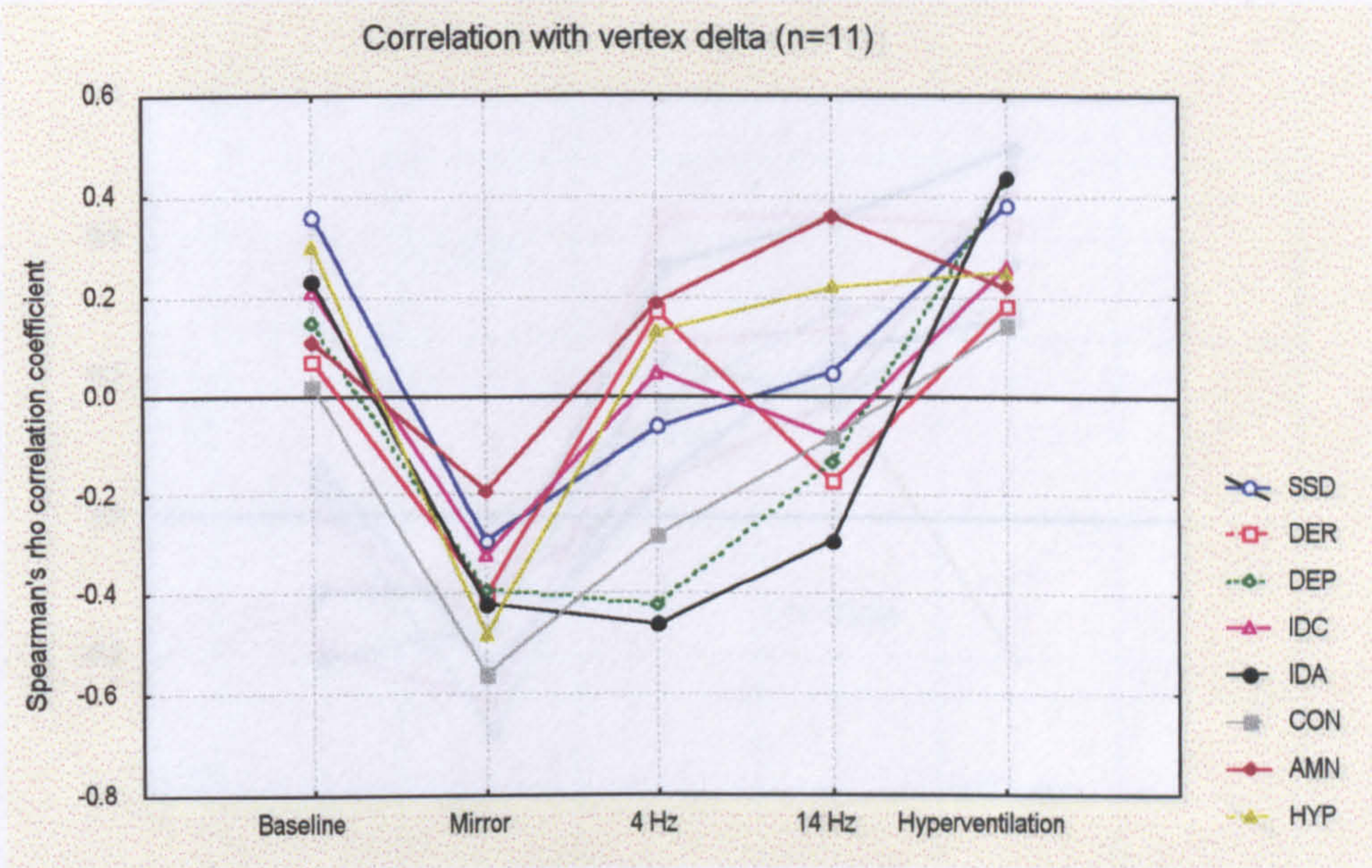


**Figure 9.5.5** Mean EEG theta power:  
Comparing groups and electrodes

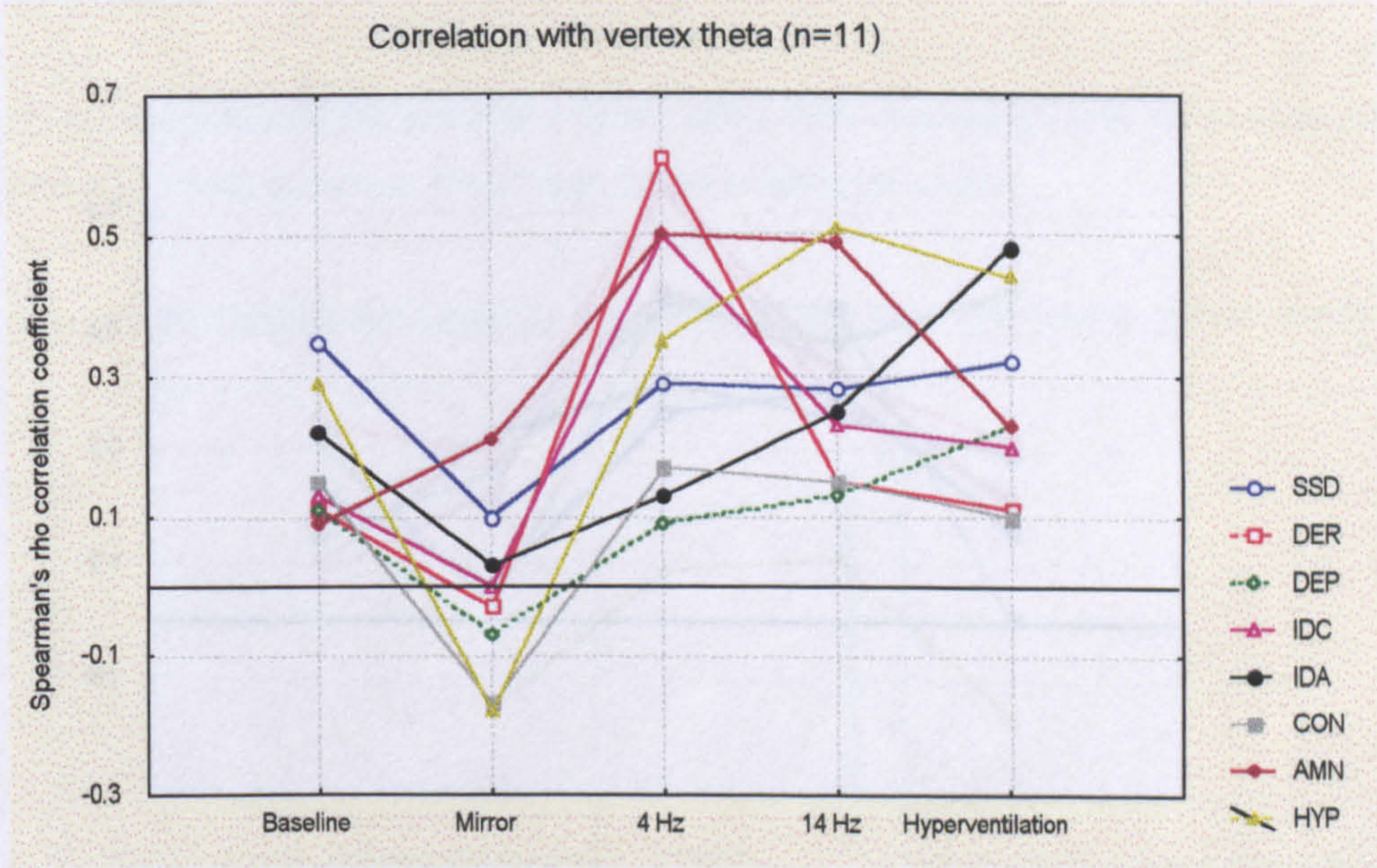




**Figure 9.6.1** Correlation of SSD and subscale scores with vertex delta power during each of 5 conditions

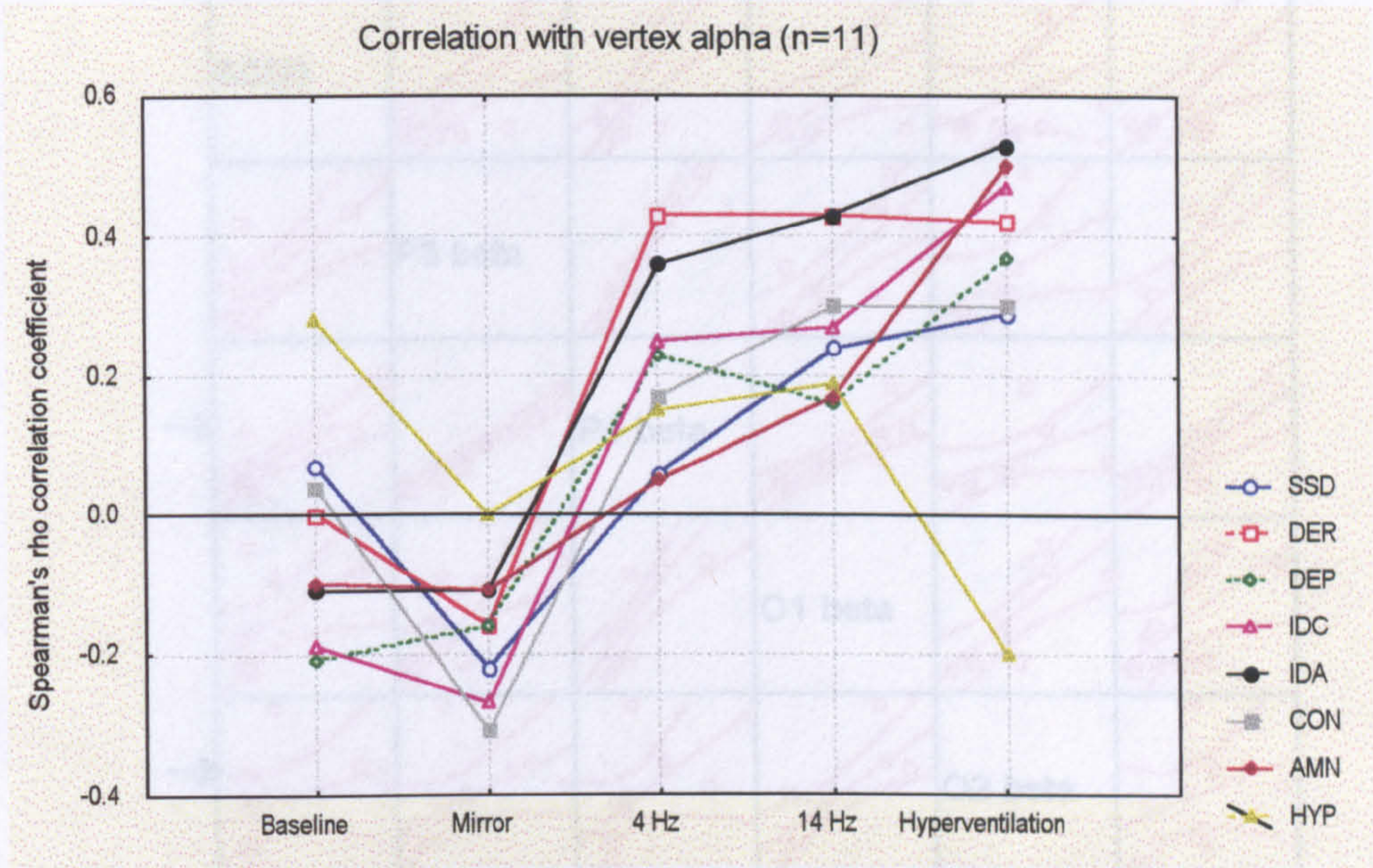


**Figure 9.6.2** Correlation of SSD and subscale scores with vertex theta power during each of 5 conditions

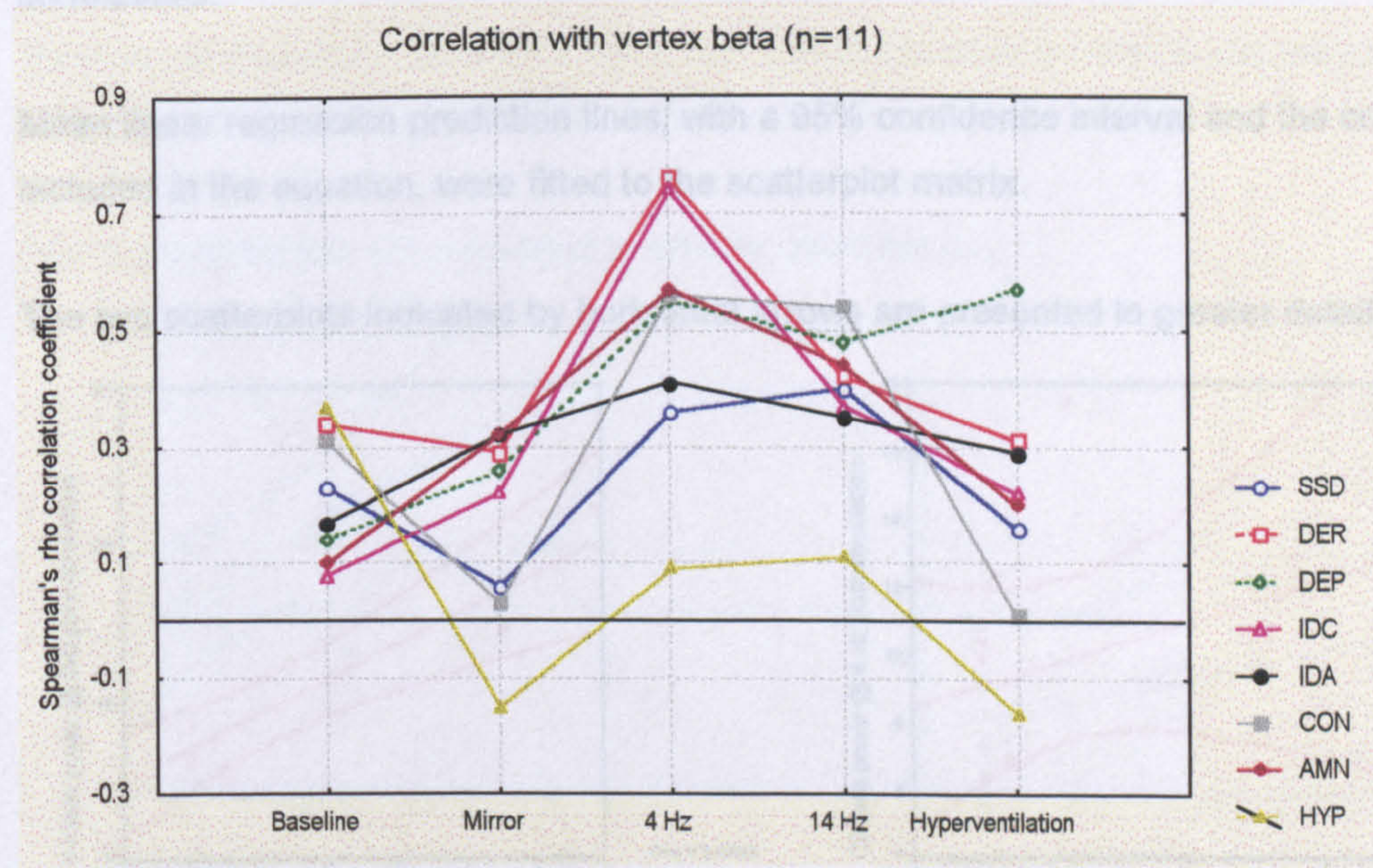




**Figure 9.6.3** Correlation of SSD and subscale scores with vertex alpha power during each of 5 conditions

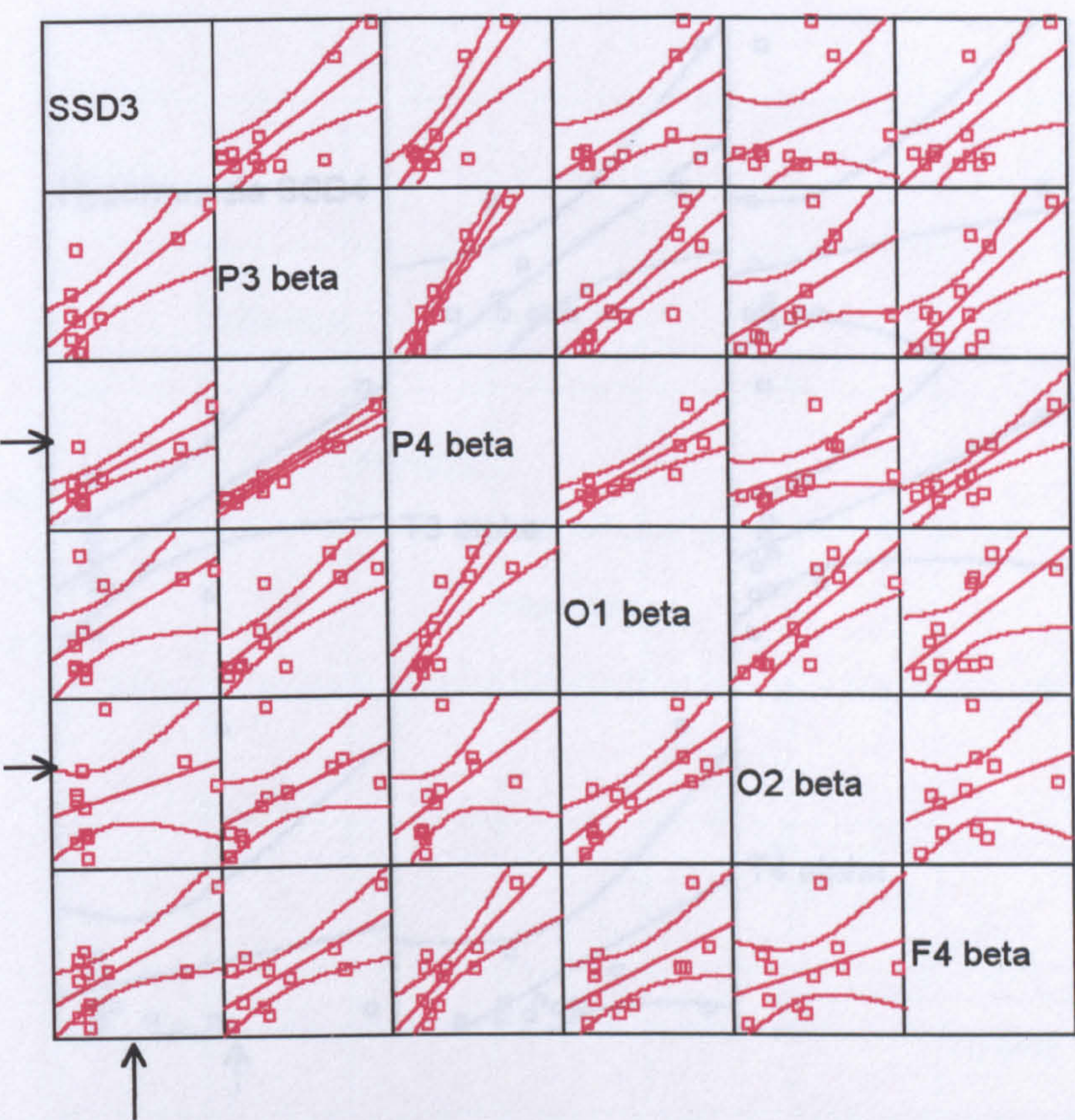


**Figure 9.6.4** Correlation of SSD and subscale scores with vertex beta power during each of 5 conditions





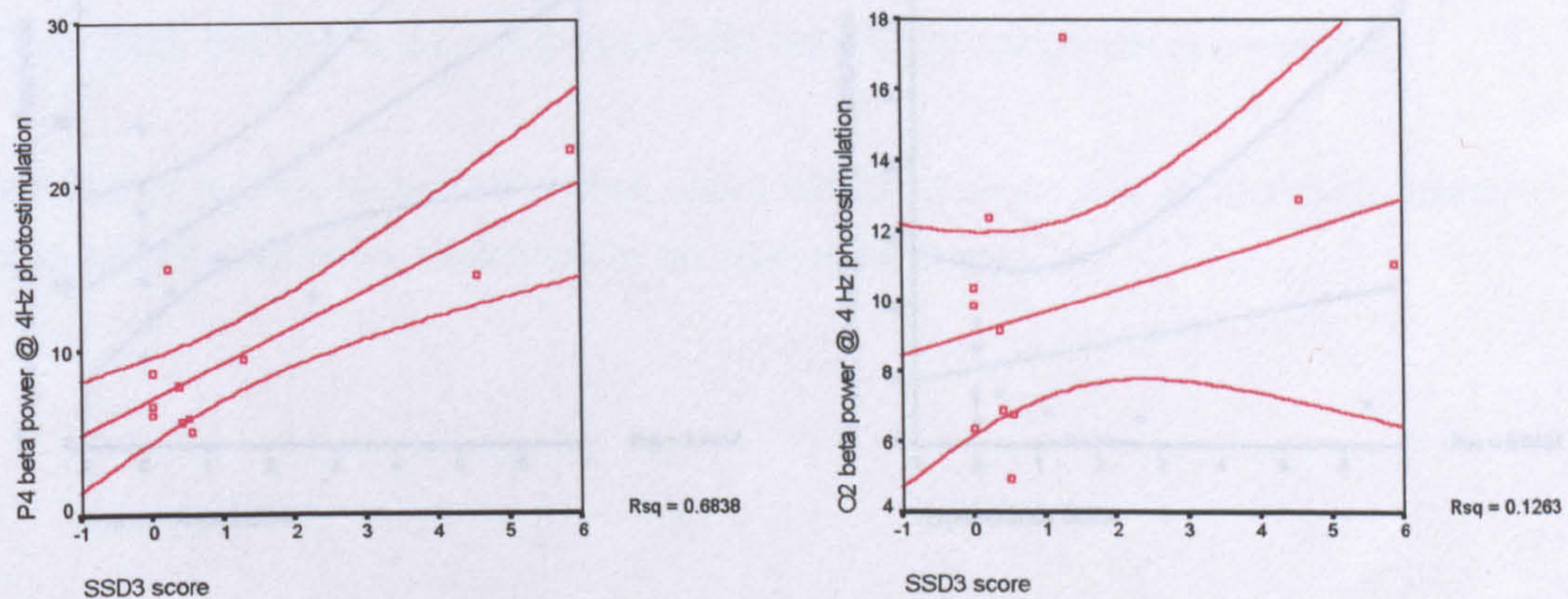
**Figure 9.7.1** Scatterplot matrix:  
SSD / beta at 4 Hz photostimulation (n=11)



The vertical arrow indicates the column showing the linear relationship between SSD score and beta power during 4 Hz photostimulation at bilateral parietal, bilateral occipital, and right frontal electrodes. These linear relationships concurred with significant canonical correlations.

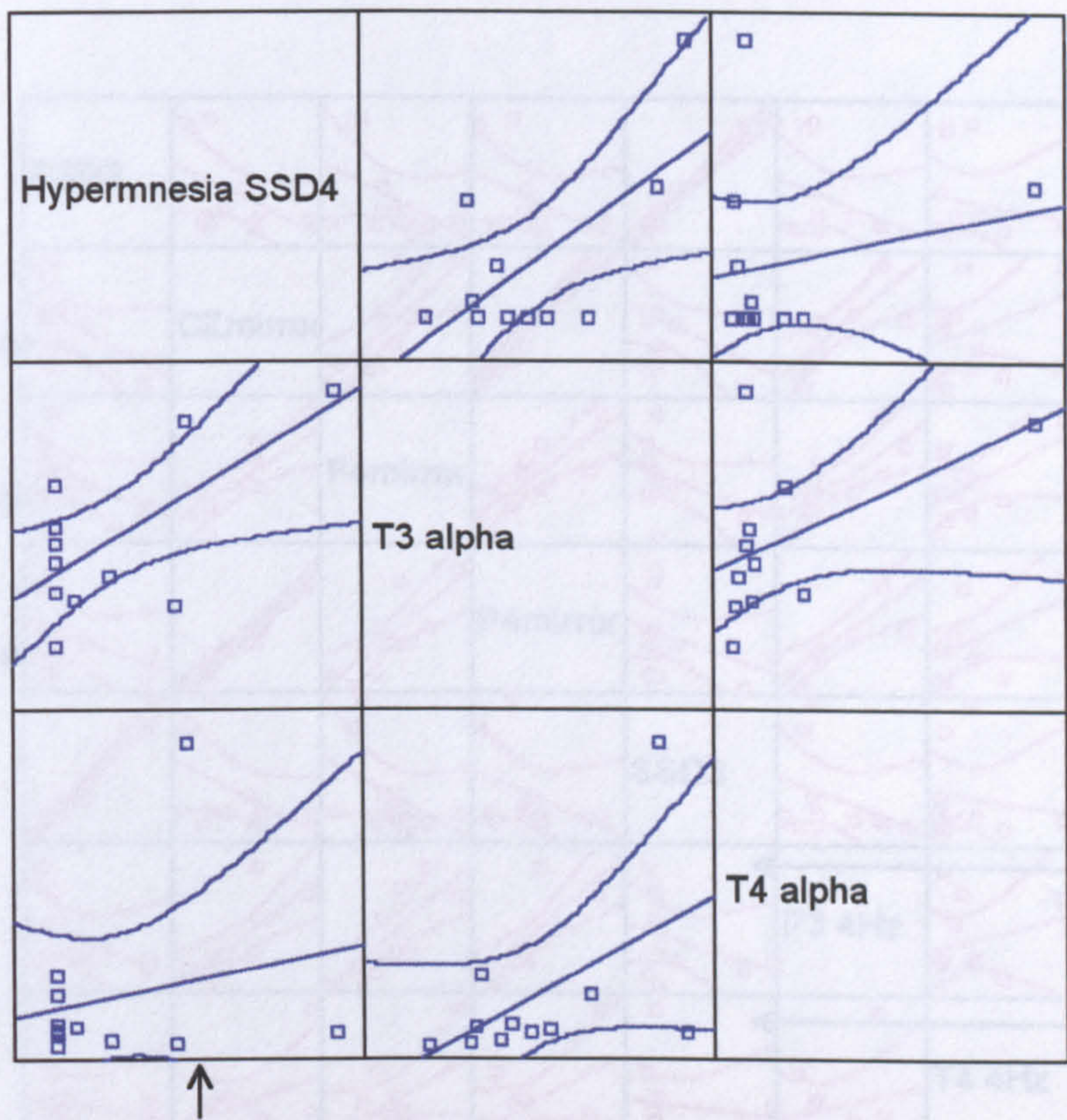
Mean linear regression prediction lines, with a 95% confidence interval and the constant included in the equation, were fitted to the scatterplot matrix.

The two scatterplots indicated by horizontal arrows are presented in greater detail below:





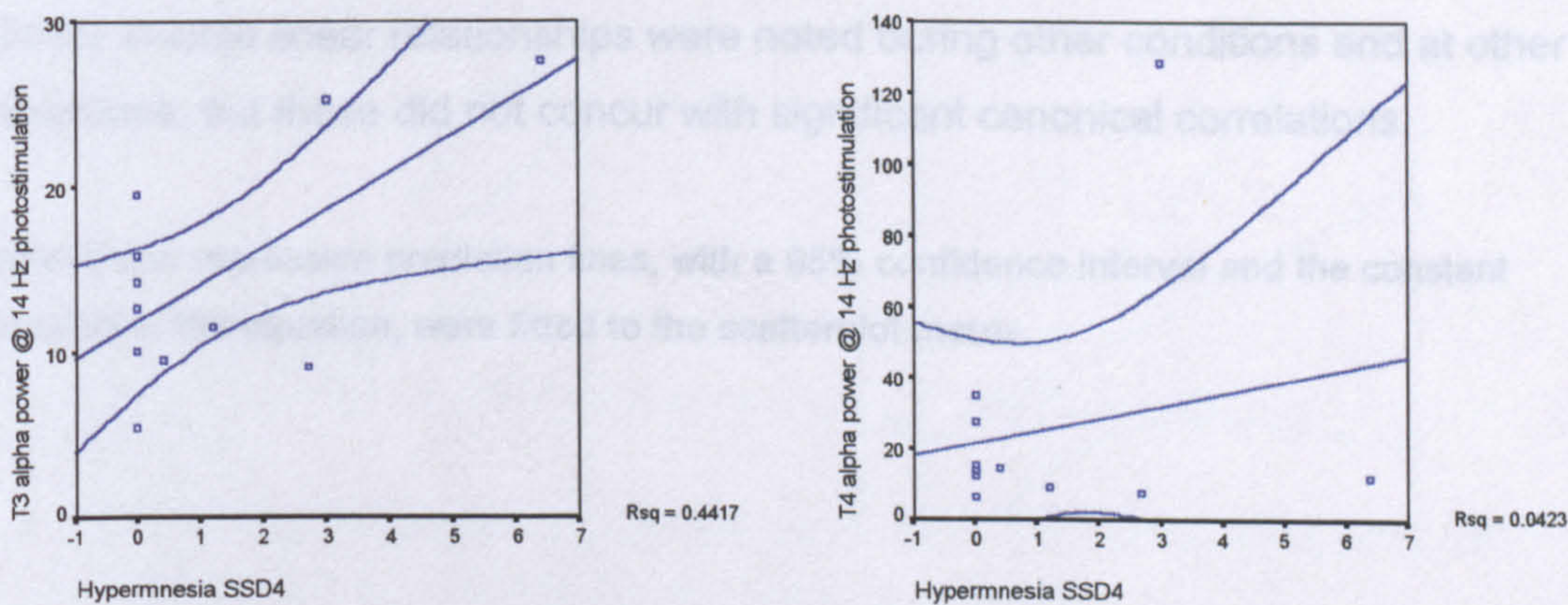
**Figure 9.7.2** Scatterplot matrix:  
Hypermnnesia / alpha at 14 Hz photostimulation (n=11)



The vertical arrow indicates the column showing the linear relationship between the SSD's hypermnnesia subscale and alpha power during 14 Hz photostimulation at the temporal electrodes. These linear relationships concurred with significant canonical correlations.

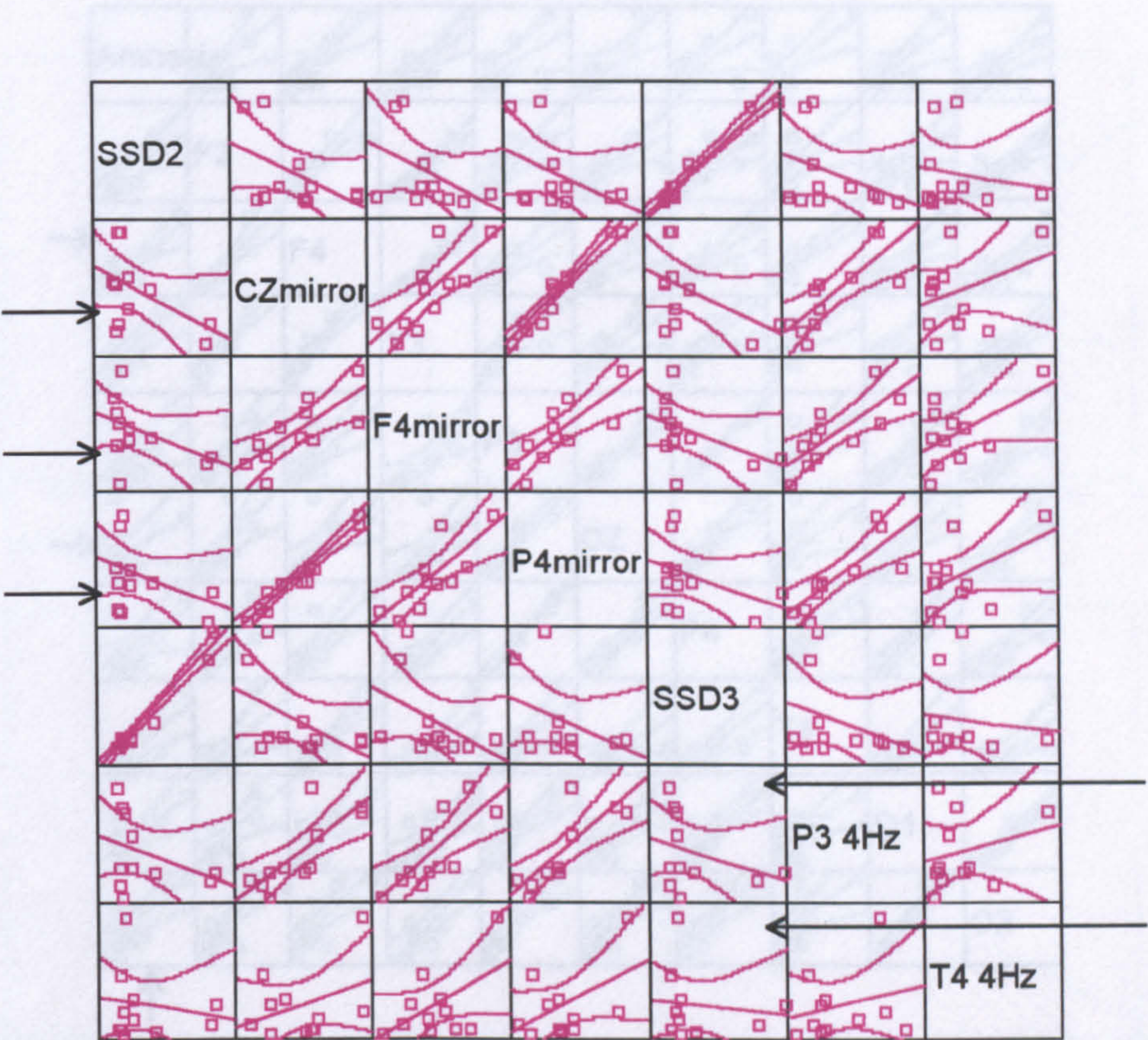
Mean linear regression prediction lines, with a 95% confidence interval and the constant included in the equation, were fitted to the scatterplot matrix.

The two scatterplots are presented in greater detail below:





**Figure 9.7.3** Scatterplot matrix:  
 SSD / delta at mirror and 4 Hz photostimulation (n=11)



The upper triangle of the matrix displays the linear relationship between the SSD's clinical ratings and delta power during hypnosis induction at all electrodes. These linear relationships concurred with significant canonical correlations.

The arrows indicate the inverse linear relationship of SSD score with delta power during

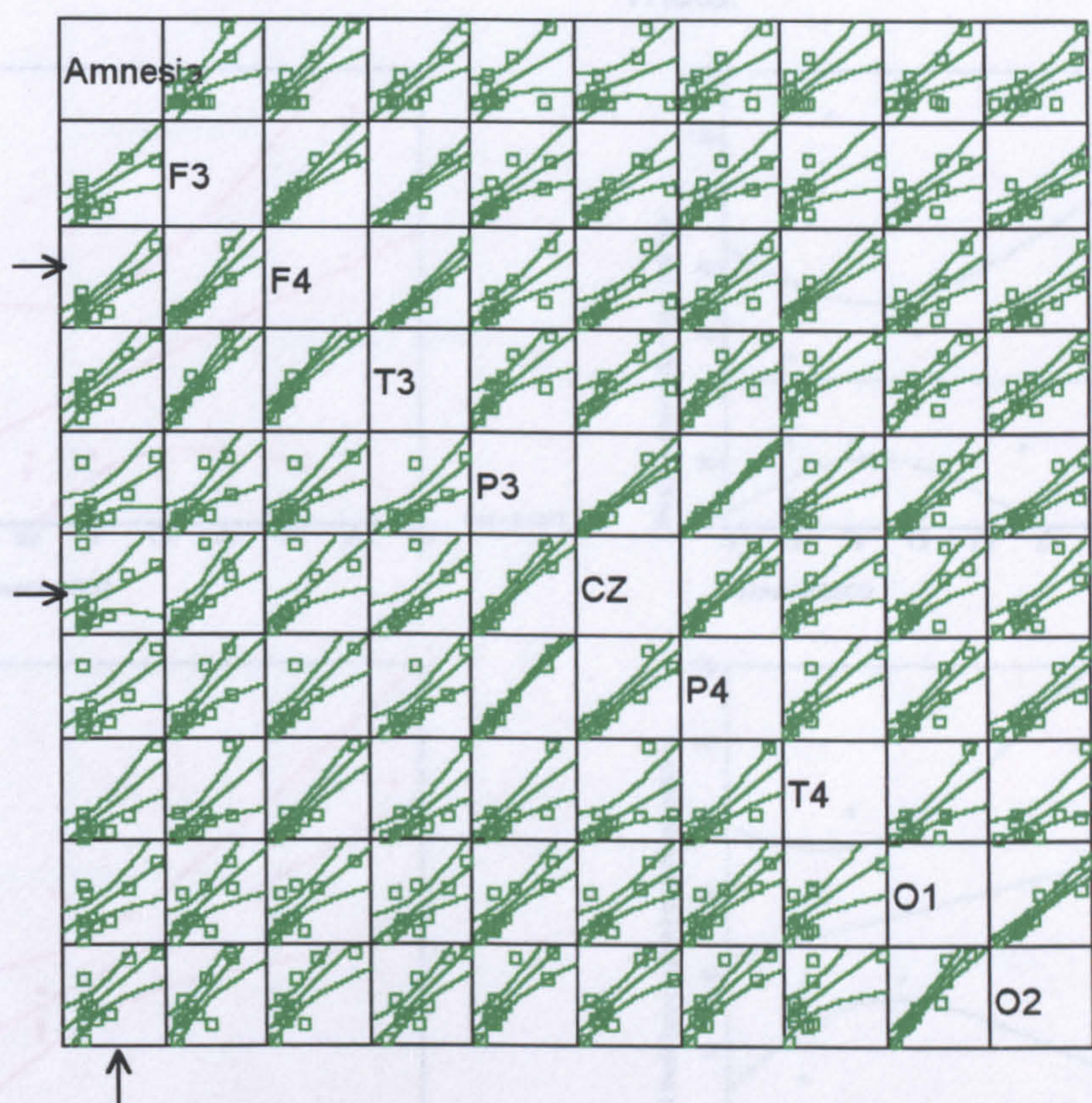
- mirror staring (vertex, right frontal, and right parietal electrodes), and
- 4 Hz photostimulation (left parietal and right temporal electrodes).

These inverse linear relationships concurred with significant canonical correlations. Similar inverse linear relationships were noted during other conditions and at other electrodes, but those did not concur with significant canonical correlations.

Mean linear regression prediction lines, with a 95% confidence interval and the constant included in the equation, were fitted to the scatterplot matrix.



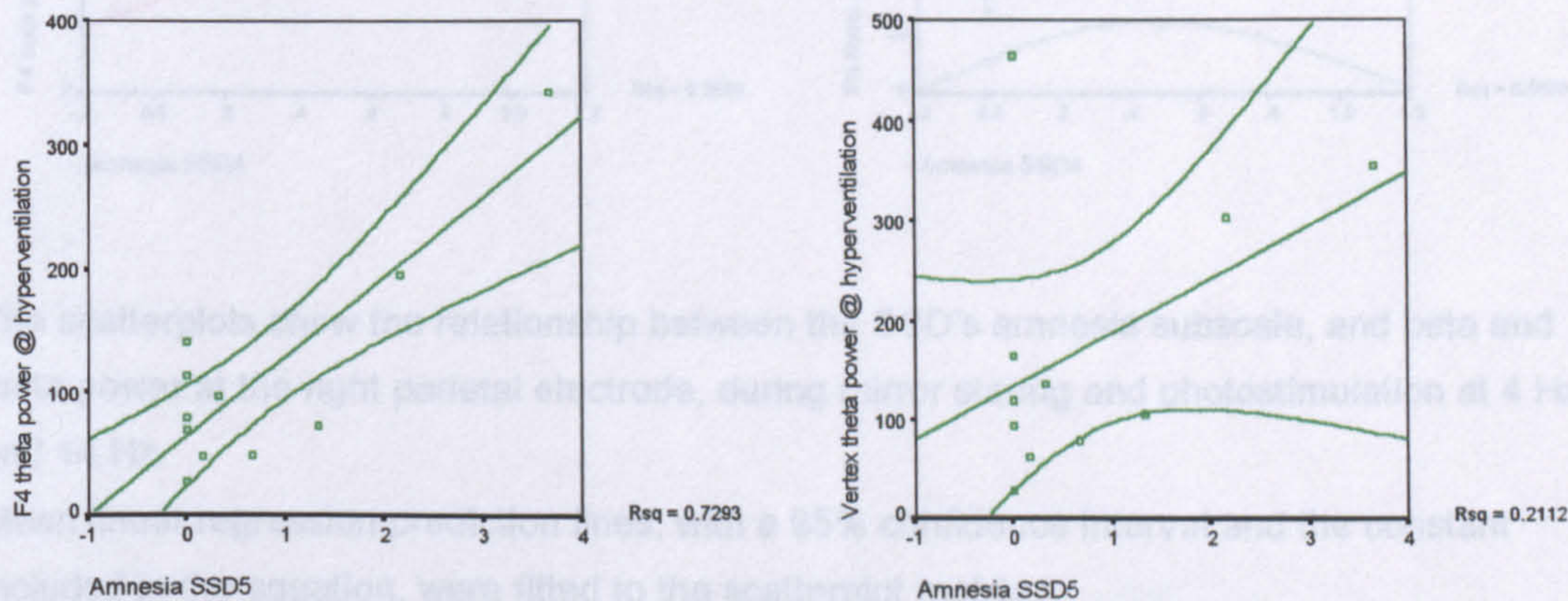
**Figure 9.7.4** Scatterplot matrix:  
Amnesia / theta power during hyperventilation (n=11)



The arrow indicates the column showing the linear relationship between the SSD's amnesia subscale and theta power during hyperventilation at all electrodes. These linear relationships concurred with significant canonical correlations.

Mean linear regression prediction lines, with a 95% confidence interval and the constant included in the equation, were fitted to the scatterplot matrix.

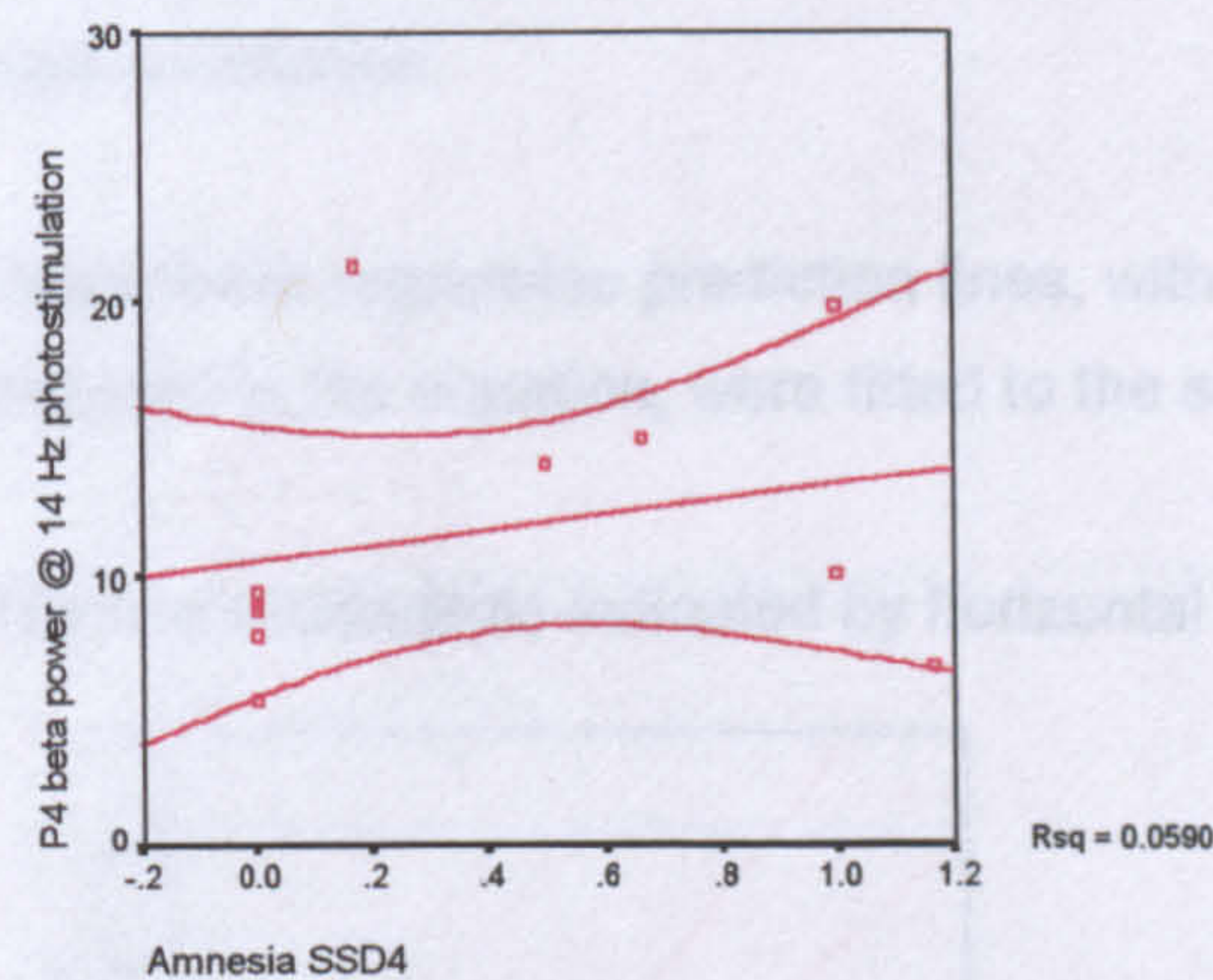
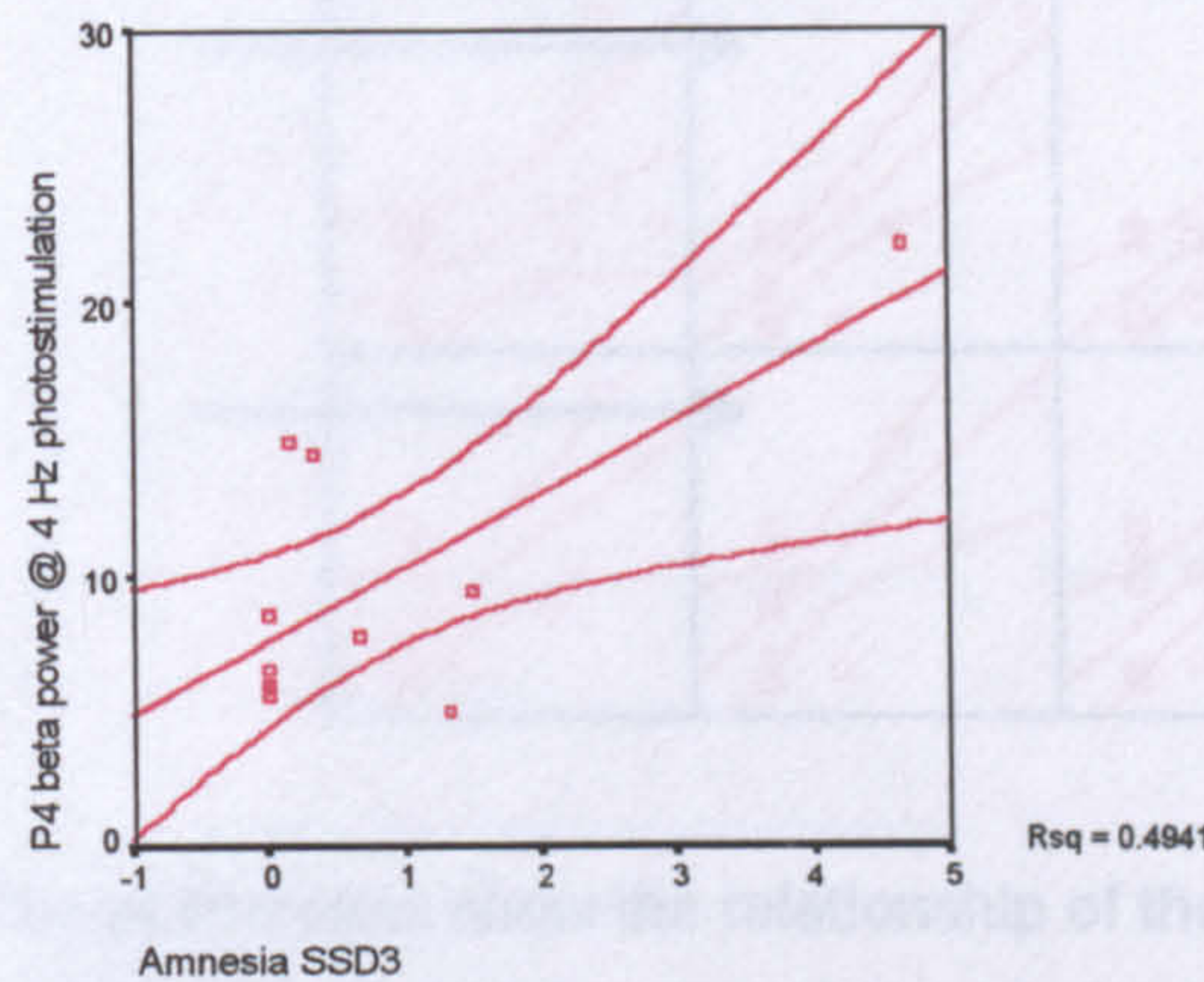
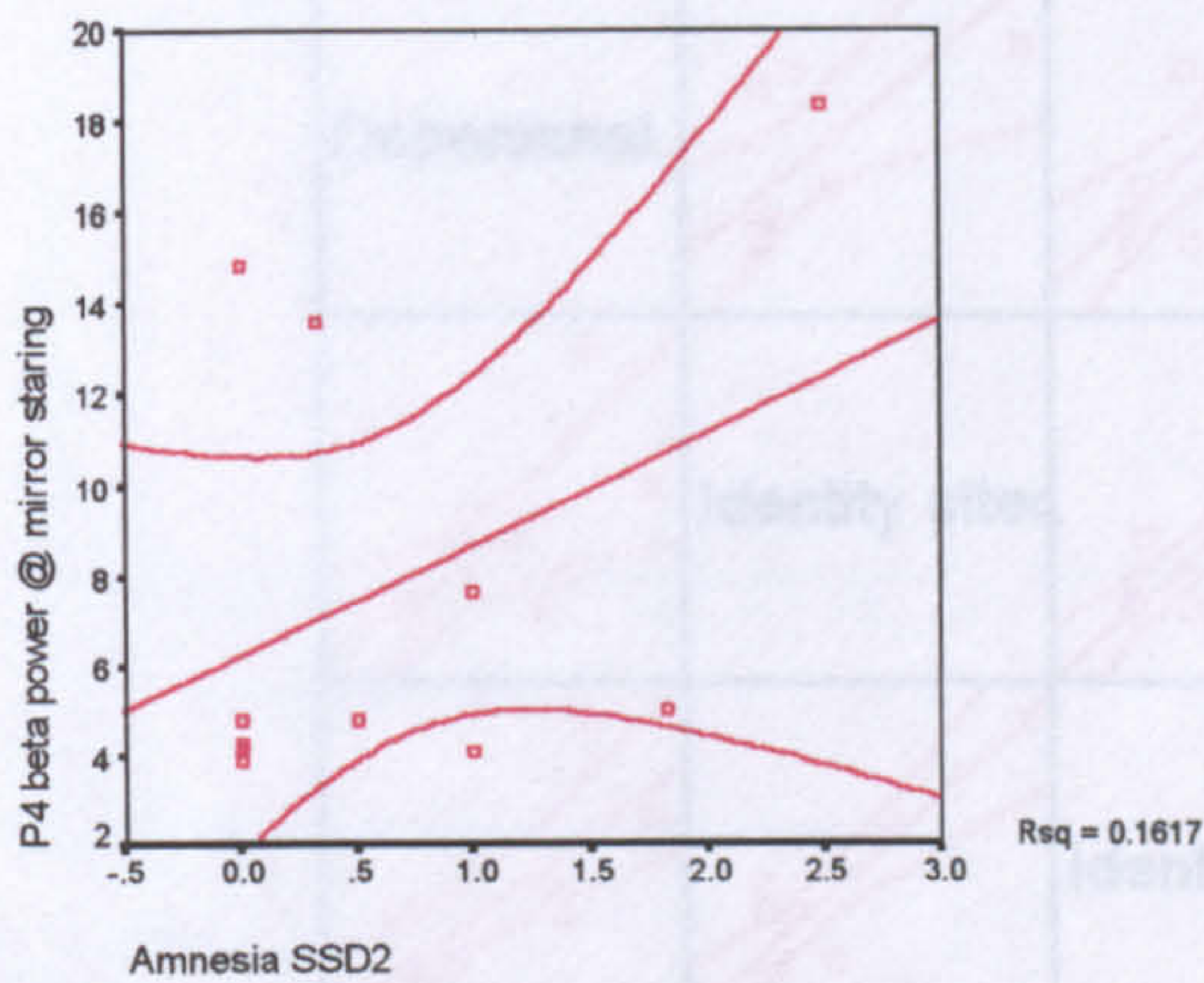
The two scatterplots indicated by horizontal arrows are presented in greater detail below:



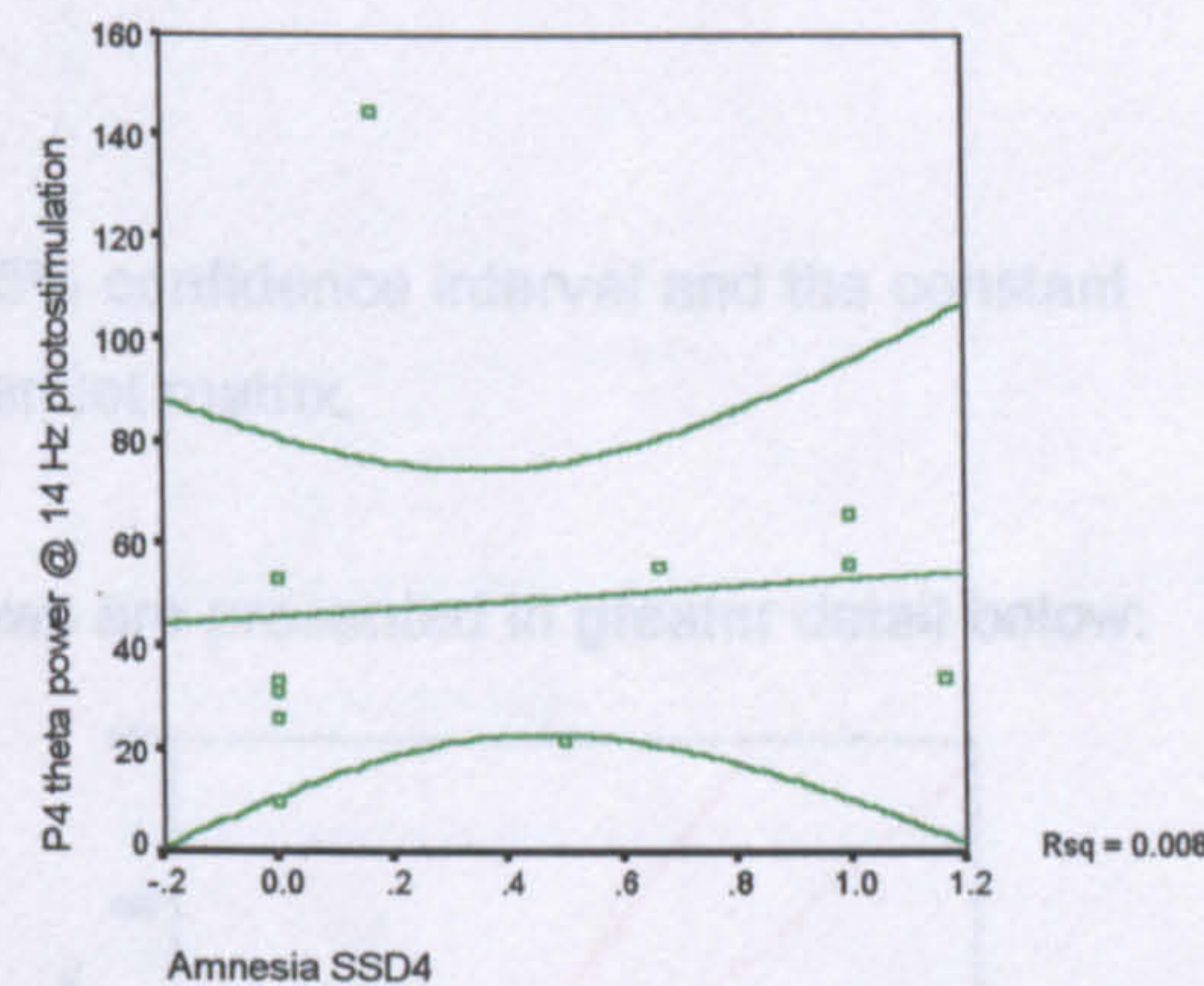
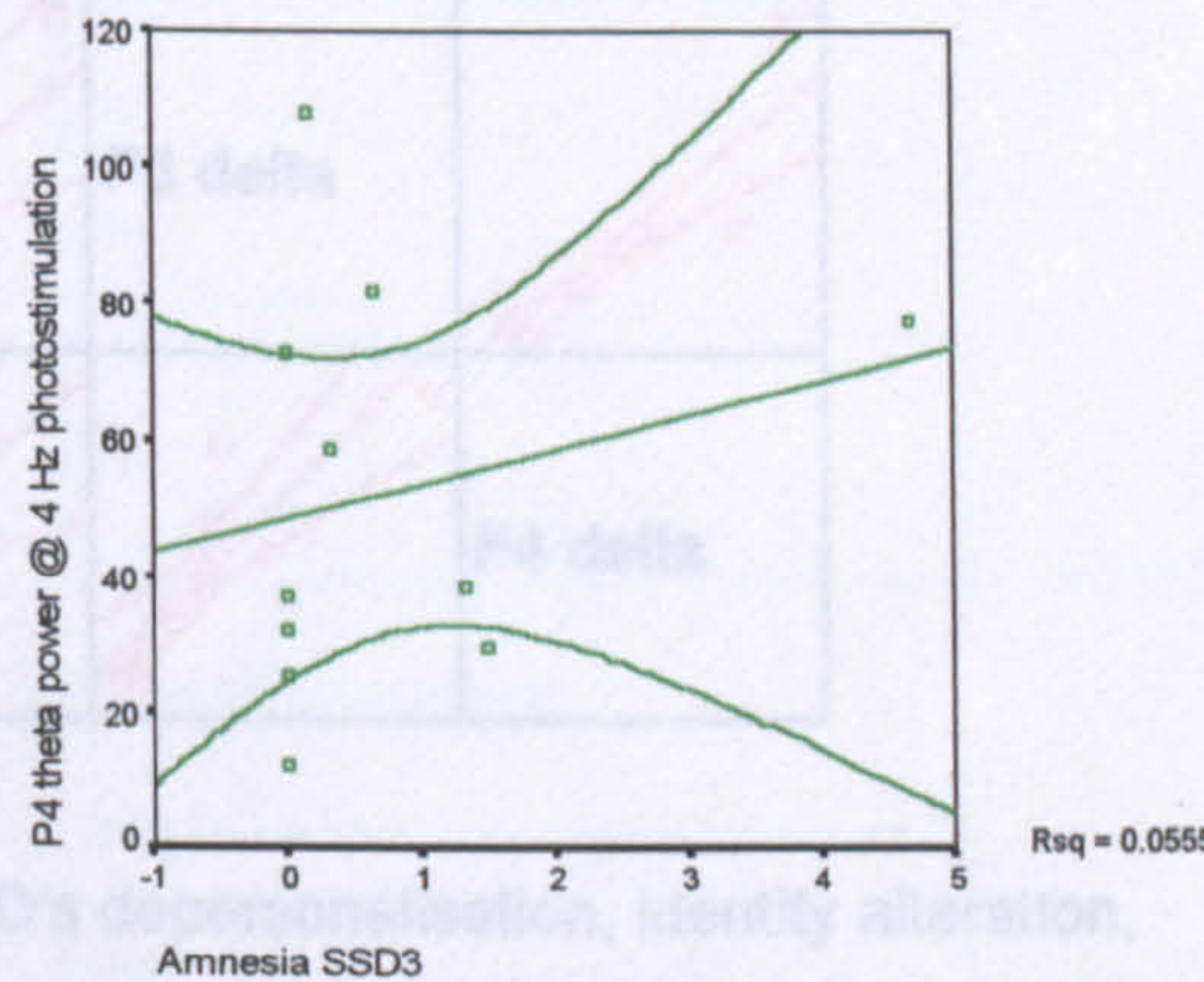
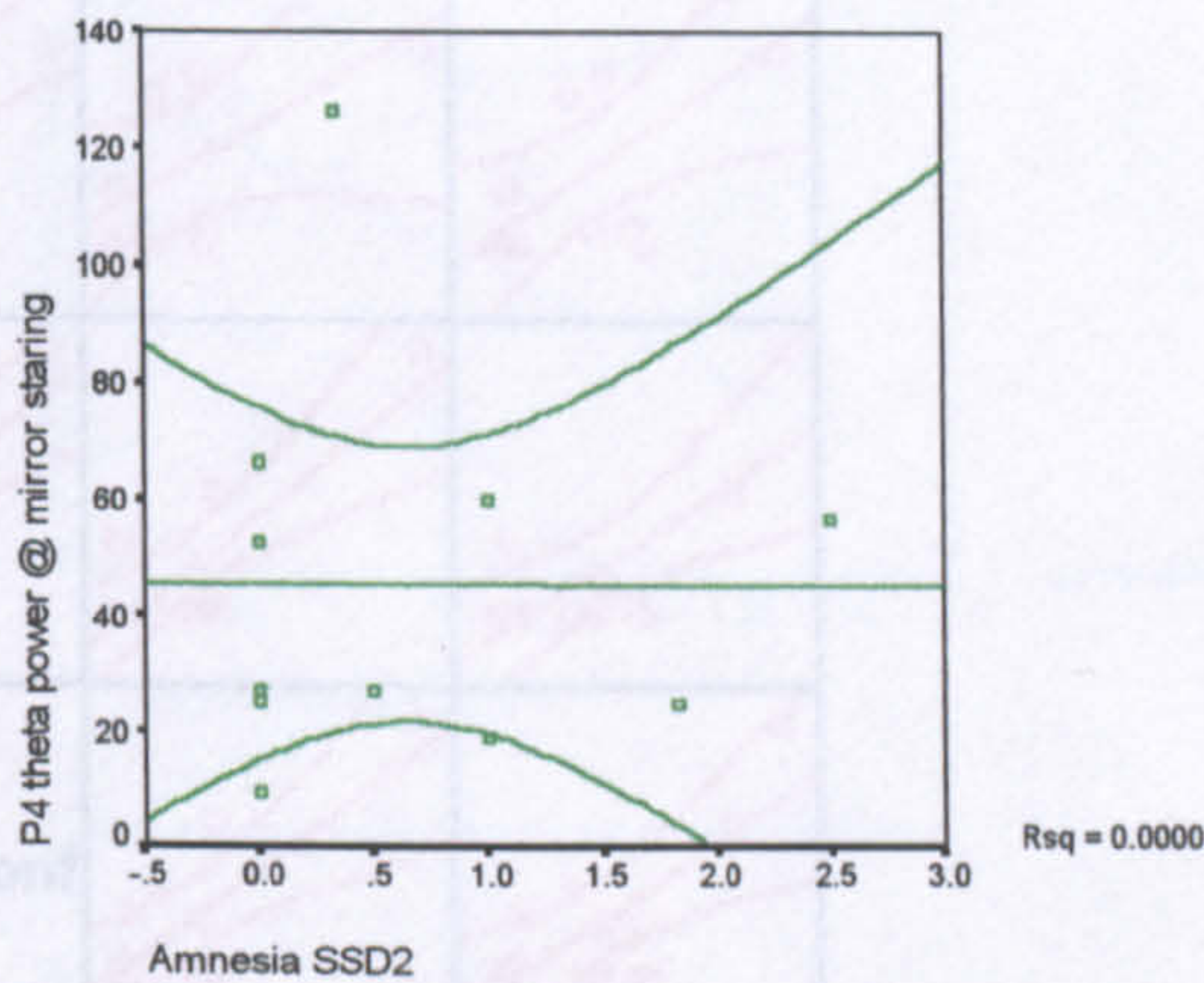


**Figure 9.7.5** Amnesia during other conditions: beta or theta? (n=11)

Beta:



Theta:

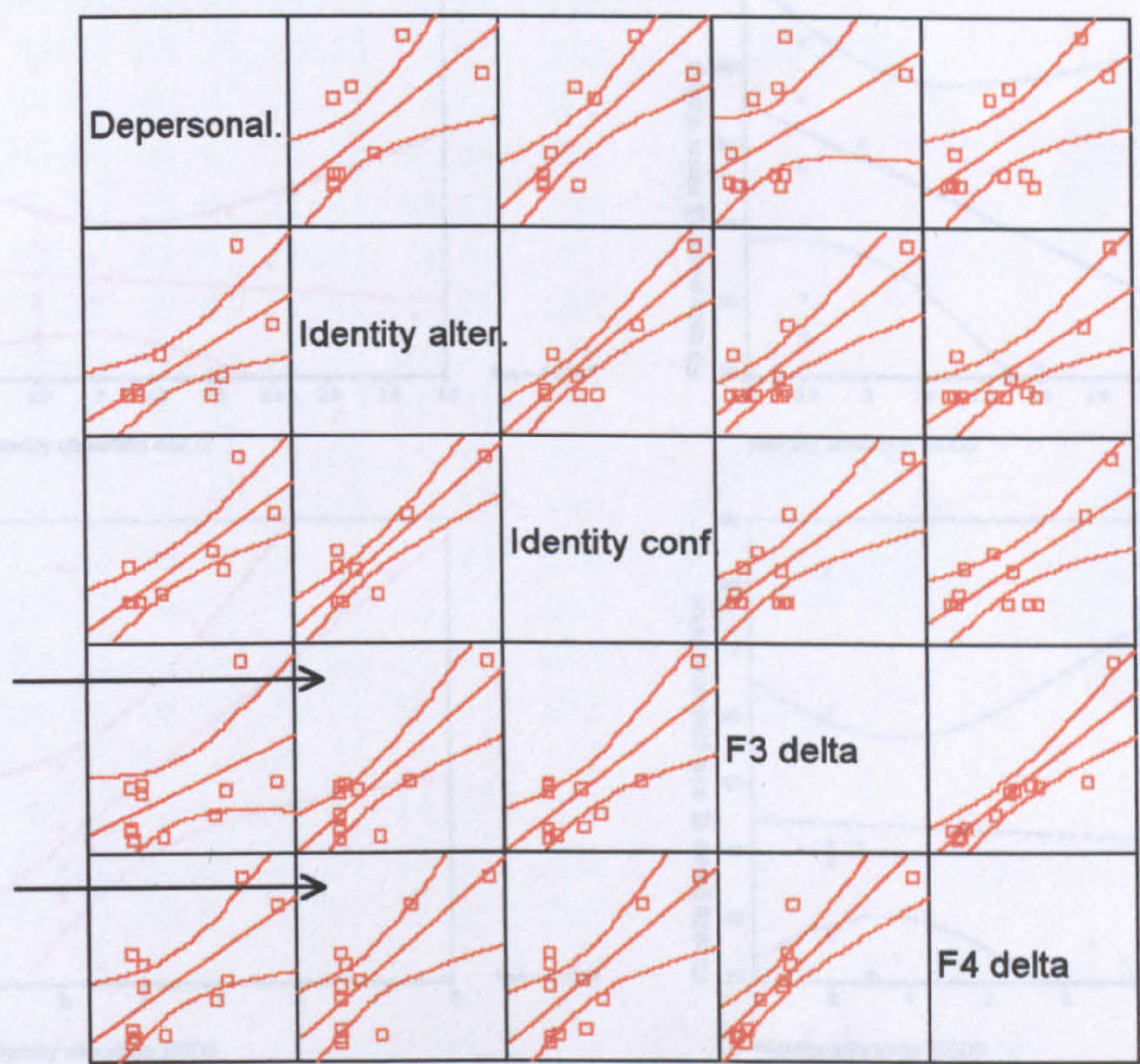


The scatterplots show the relationship between the SSD's amnesia subscale, and beta and theta power at the right parietal electrode, during mirror staring and photostimulation at 4 Hz and 14 Hz.

Mean linear regression prediction lines, with a 95% confidence interval and the constant included in the equation, were fitted to the scatterplot matrix.



**Figure 9.7.6** Scatterplot matrix:  
SSD / frontal delta power at hyperventilation (n=11)



The scatterplots show the relationship of the SSD's depersonalisation, identity alteration, and identity confusion subscales, with delta power at the frontal electrodes during hyperventilation.

Mean linear regression prediction lines, with a 95% confidence interval and the constant included in the equation, were fitted to the scatterplot matrix.

The two scatterplots indicated by horizontal arrows are presented in greater detail below:

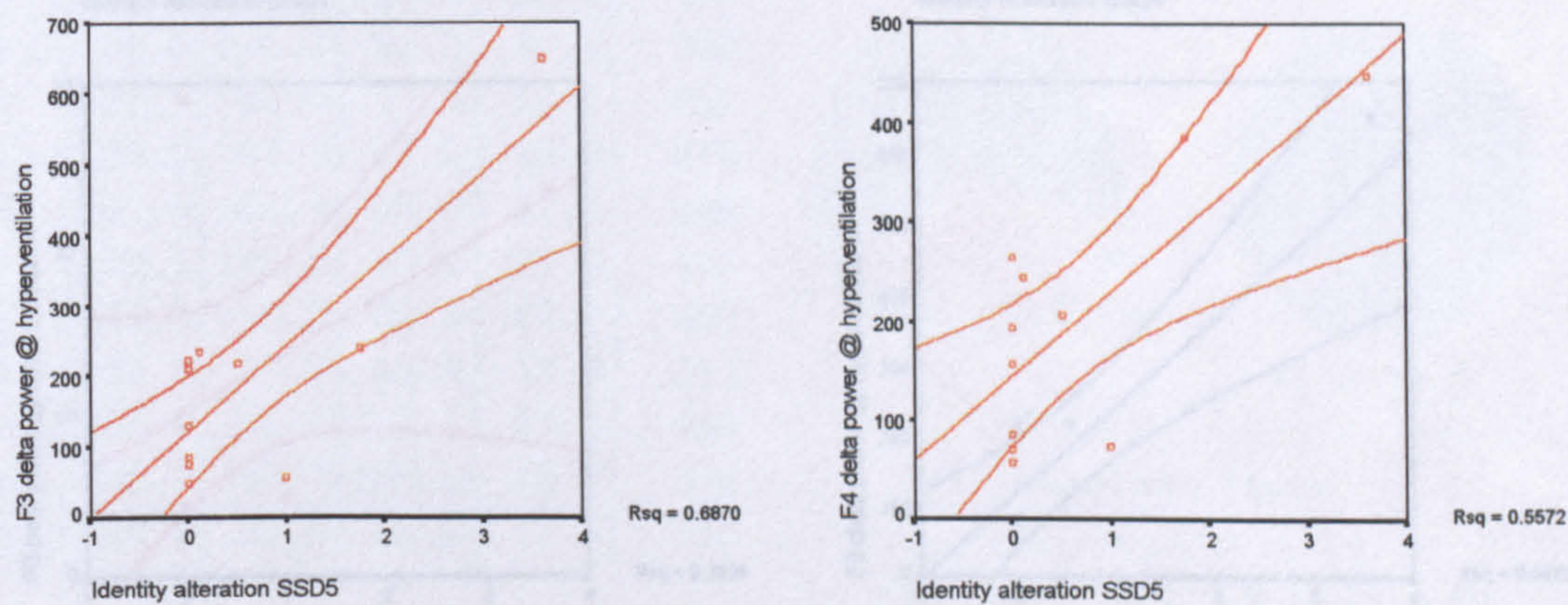




Figure 9.7.7 Identity alteration: beta or delta? (n=11)

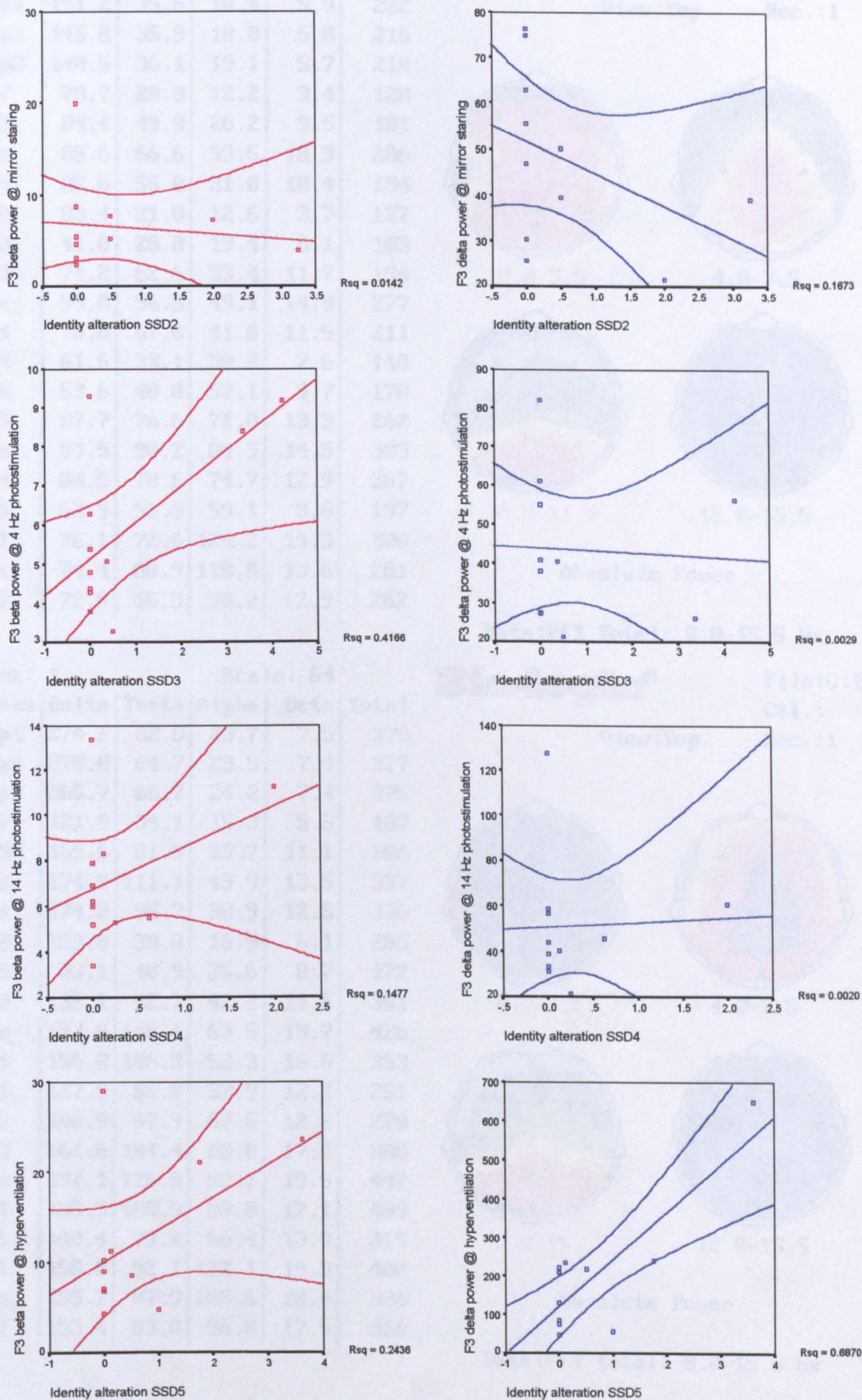
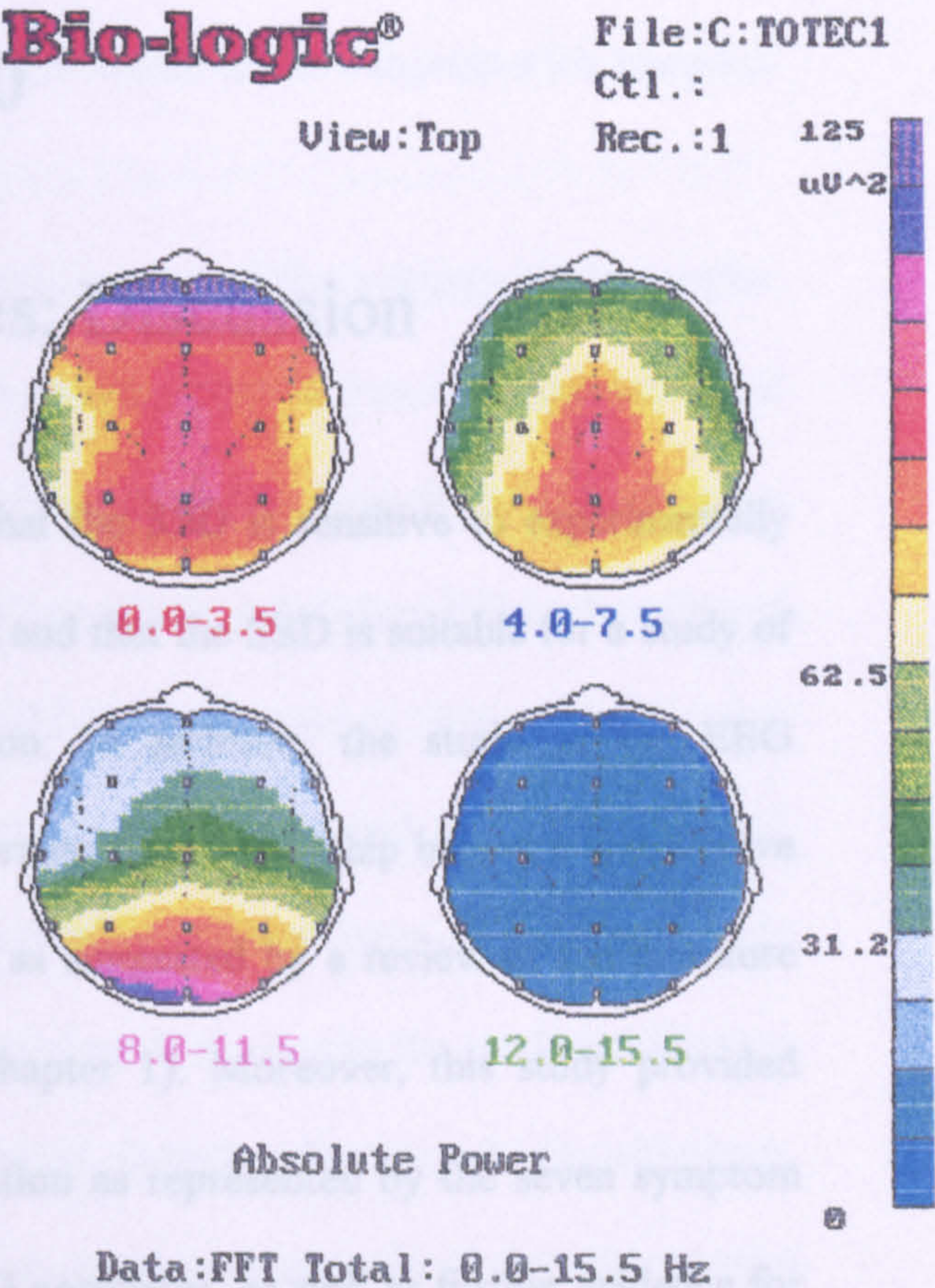




Figure 9.8 Brain map of waveband power at baseline and hyperventilation (n=11)

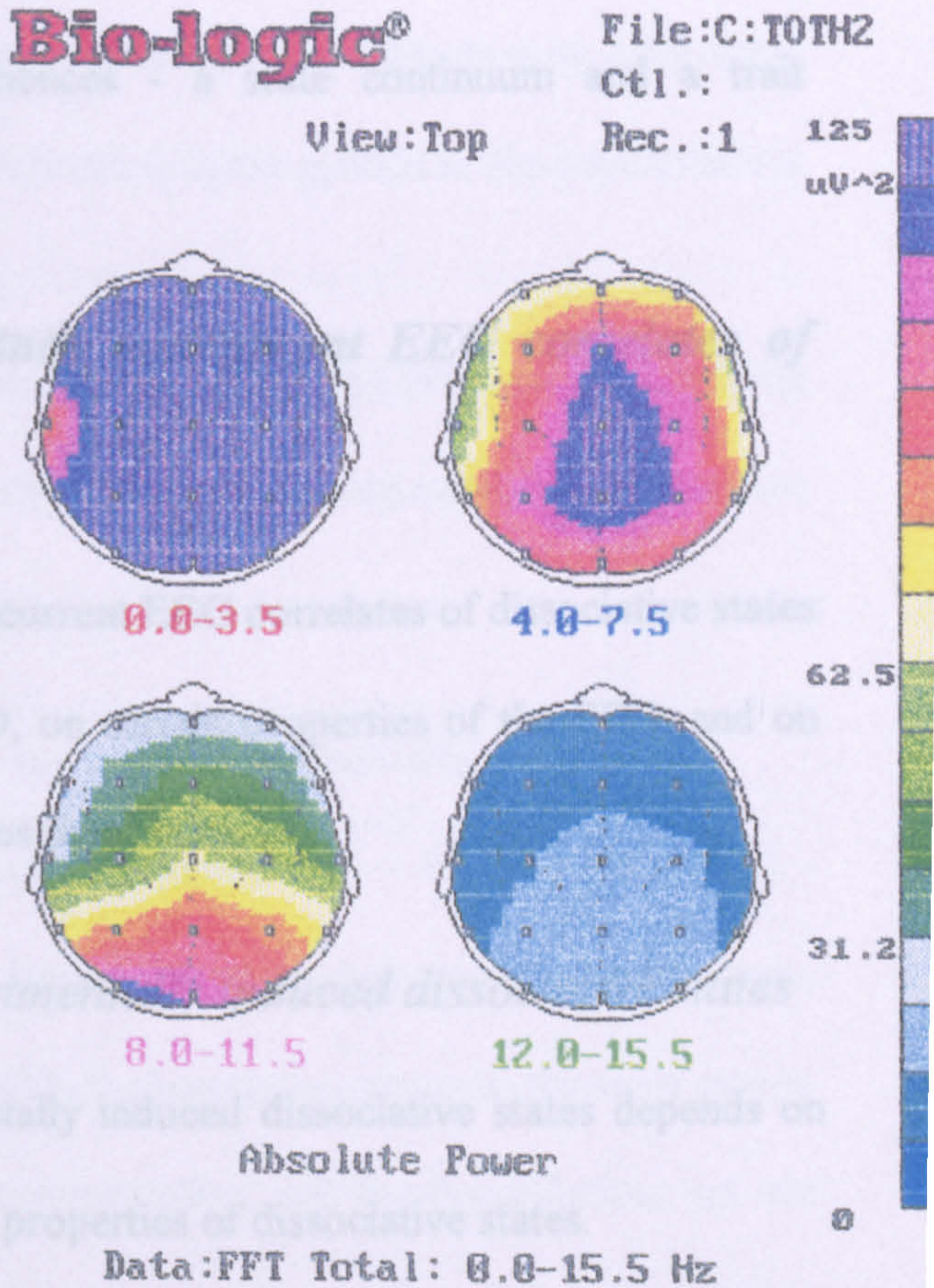
Bank: 1                      Scale: 64

Sites	Delta	Theta	Alpha	Beta	Total
Fp1	151.2	35.6	18.4	5.9	222
Fpz	145.8	35.9	18.8	5.8	216
Fp2	140.5	36.1	19.1	5.7	210
F7	78.7	20.8	12.2	3.4	120
F3	84.4	49.0	26.2	9.5	181
Fz	85.6	66.6	33.5	10.3	206
F4	85.6	55.0	31.0	10.4	194
F8	83.4	21.8	12.6	3.7	127
T3	41.0	28.0	19.4	6.1	103
C3	74.2	62.6	33.4	11.7	194
Cz	99.8	96.5	49.1	14.9	277
C4	78.8	67.6	41.0	11.5	211
T4	61.6	39.1	30.2	7.6	148
T5	53.6	48.0	57.1	9.7	178
P3	87.7	76.6	71.8	13.3	262
Pz	99.5	90.2	84.5	14.5	303
P4	88.5	78.6	74.7	12.9	267
T6	62.9	56.3	59.1	9.5	197
O1	76.1	72.6	124.2	14.3	300
Oz	74.4	68.9	110.8	13.6	281
O2	72.8	65.3	98.2	12.9	262



Bank: 1                      Scale: 64

Sites	Delta	Theta	Alpha	Beta	Total
Fp1	274.5	62.8	23.7	7.5	379
Fpz	270.0	64.7	23.9	7.4	377
Fp2	265.7	66.7	24.2	7.4	375
F7	121.9	34.1	15.3	5.5	187
F3	165.6	81.5	33.7	11.1	306
Fz	174.9	111.1	43.9	13.5	357
F4	174.2	95.7	38.9	12.5	336
F8	133.9	38.8	16.9	6.1	205
T3	83.1	40.9	25.6	8.7	172
C3	132.1	92.7	42.2	14.6	301
Cz	177.8	146.1	63.5	19.7	426
C4	156.0	106.3	53.3	16.6	353
T4	127.9	55.9	37.9	12.2	251
T5	106.9	67.9	67.6	12.2	270
P3	161.6	104.4	80.8	17.3	380
Pz	192.1	126.0	93.7	19.5	447
P4	183.3	108.9	83.8	17.1	409
T6	148.4	73.0	66.4	13.3	315
O1	158.0	92.1	122.1	19.3	408
Oz	155.7	87.9	108.6	18.4	386
O2	153.4	83.8	96.0	17.5	366





## EEG correlates: Discussion

The discussion in this chapter concludes that the SSD is sensitive to experimentally induced temporal variability of dissociation and that the SSD is suitable for a study of concurrent EEG correlates of dissociation. In addition, the study of the EEG correlates confirmed the hypotheses concerning the relationship between dissociative experiences and concurrent EEG activity, as suggested by a review of the literature (cf. Chapter 8, section 8.2.2 and also Chapter 1). Moreover, this study provided evidence for the heterogeneity of dissociation as represented by the seven symptom groups in the SSD and their different EEG correlates, as well as further evidence for the two continua of dissociative experiences - a state continuum and a trait continuum.

### *10.1 The SSD can be used to study concurrent EEG correlates of dissociative states*

The suitability of the SSD to measure concurrent EEG correlates of dissociative states depends on certain properties of the SSD, on certain properties of the EEG, and on successful co-ordination of these properties in time.

#### *10.1.1 The SSD is sensitive to experimentally induced dissociative states*

The sensitivity of the SSD to experimentally induced dissociative states depends on certain properties of the SSD and certain properties of dissociative states.



#### **10.1.1.1      The SSD measures dissociative states in the subjects with complex partial epilepsy**

The results of the baseline SSD and subscale scores of the subjects with complex partial epilepsy (CPE) were compared to the results of the SSD and subscale scores of the subjects in the psychometric validation of the SSD. The mean SSD score of all the subjects with CPE during the baseline condition (Table 9.1.2) was higher than that of the control group in the psychometric validation (Chapter 6, Figure 6.5.1), and showed a wider 95% confidence interval that extended beyond that of the control group in the psychometric validation. The 95% confidence intervals of the subjects with CPE are wide relative to the mean scores, probably due to the small sample size. In particular, the SSD subscales of derealisation, depersonalisation, identity alteration, conversion, and hypermnesia yielded higher mean baseline scores than the control group. However, the mean SSD and subscale scores of the subjects with CPE were not as high as the scores of any of the psychiatric patient groups in the psychometric validation (Chapter 6, Figure 6.5.1).

The above comparison suggests that the patients with CPE were experiencing mild dissociative states at the time of data collection, as measured by the baseline SSD.

#### **10.1.1.2      Dissociative states can be induced experimentally**

The increases in the SSD and subscale scores (Figures 9.1.1 - 9.1.8; Figures 9.4.1 - 9.4.5) suggest that dissociative states had been induced by the experiments. However, the 4 experimental procedures did not all induce dissociative states to the same extent.

The particularly prominent enhancing effect of hyperventilation on the intensity of dissociative experiences concurs with observations of an association



between depersonalisation symptoms and over-breathing in patients with panic disorder, other anxiety disorders, and even other psychiatric disorders (Cohen, 1988).

The mirror staring experiment appeared to have the opposite effect in some respects, i.e. it reduced some dissociative experiences. The patients with a left-sided epileptic focus showed a reduction in most dissociative symptoms during the mirror staring experiment. In particular, their mean score for identity alteration symptoms dropped markedly after staring into the mirror (Figures 9.4.1 - 9.4.3). On the other hand, depersonalisation scores increased markedly after staring into a mirror, especially in the patients with a right-sided focus, providing support for the findings by Miller et al. (1994) where staring into a mirror was an effective method to induce depersonalisation and derealisation experiences (cf. Chapter 8, section 8.3.3.1). While staring into a mirror induced depersonalisation experiences in patients with a right-sided epileptic focus, it appears that the confrontation of patients with a left-sided focus with their mirror image may be beneficial to their sense of an integrated identity.

The question arises whether the effect (on the SSD and on the EEG) from the mirror-staring experiment depends on the study population. This question might be addressed by more extensive studies on the effects of mirror staring in larger samples, e.g., of subgroups of patients with various diagnoses and control subjects. Nevertheless, the differential effect of mirror staring on dissociation and EEG changes casts doubt over its utility as a consistent precipitant of dissociative states.

#### **10.1.1.3 The SSD is sensitive to the temporal variability of the experimentally induced dissociative experiences**

Given that the SSD measured the severity of dissociative experiences at the time of each experimental induction, and that each experimental induction was successful, the



expectation would be that the SSD scores of the patients with CPE would reflect significant changes in dissociative experiences across the experimental conditions. This expectation was supported partially by the Friedman test (cf. Chapter 8, section 8.5.5.4 and Chapter 9, Figures 9.1.1 - 9.1.8) insofar as it showed that experimentally induced dissociation was statistically increased significantly above baseline levels for two of the subscales, namely depersonalisation and conversion. The fact that only depersonalisation and conversion changed significantly, and the absence of significant changes among the other subscales, can probably be attributed partially to the small sample size.

A second factor that may have dampened the statistical significance of the changes in the SSD subscale scores is the lesser reactivity of the patients with a left-sided epileptic focus in comparison with patients with a right-sided focus (Figure 9.4.4). If anything, the patients with a left-sided focus showed decreased levels of dissociation (for most of the SSD subscales) during the mirror-staring experiment and photostimulation, compared to the baseline condition. On the other hand, hyperventilation did precipitate increased levels of dissociation, even in the patients with a left-sided focus.

A comparison of the patients' SSD scores after experimental induction with the SSD scores of the clinical and control samples in the psychometric validation data showed that the increased experimental SSD scores of the patients with CPE (Figures 9.1.1 - 9.1.8; Figures 9.4.1 - 9.4.5) still fell between the scores of the control group and the psychiatric patient groups in the psychometric validation (Chapter 6, Figure 6.5.1), but with a wider confidence interval. In other words, the CPE patients experienced more severe dissociative symptoms after experimental induction than at



baseline, but the symptoms were not as severe as in any of the psychiatric patient groups.

Although the degree of reactivity of the SSD and subscale scores to the experimental induction procedures was less than what was hoped for, the canonical analyses still showed that the less-than-dramatic changes in SSD and subscale scores were sufficient to result in significant canonical correlations between some subscales and some EEG wavebands, and permitted the conclusion that the SSD is sensitive to the temporal variability of the experimentally induced dissociative experiences.

Future studies of the sensitivity of the SSD to temporal variability in the intensity of dissociation might be done in different patient samples and control subjects in order to test the degree of the sensitivity to temporal variability, since it may depend on the study population rather than on the SSD.

#### *10.1.2 The EEG is sensitive to experimentally induced dissociative states*

From the results of the Friedman tests in Figures 9.2.1 - 9.2.4 it is clear that the power of all 4 EEG wavebands, i.e. delta, theta, alpha, and beta power, changed significantly over the 5 experimental conditions. The greatest reactivity (an increase) of the EEG parameters was seen during the hyperventilation condition. During the other experimental conditions, there was relatively little change compared to the effect of hyperventilation. Furthermore, the patients with a right-sided focus showed a reduction in mean absolute power in all 4 wavebands during the mirror staring experiment (Figure 9.5.2), which might explain the negative correlations in Figures 9.6.1 - 9.6.4 during the mirror-staring experiment.



### *10.1.3 Now dissociative state changes and EEG changes can be measured concurrently*

This study was designed in order to collect SSD and EEG data as concurrently as practically possible. This was achieved by recording the EEG during each experimental condition and administering the SSD immediately (within seconds) after each experimental induction. However, the rate of weakening of the experimental dissociative effect when the induction procedure was discontinued and the subsequent return to baseline dissociative levels might have affected concurrent measurements of dissociation and EEG changes. The question is how long it takes for the experimental effect to wear off, e.g., after mirror staring or hyperventilation. EEG post-hyperventilation is considered as returning to its pre-hyperventilation state after about 2-3 minutes (Duffy et al., 1989). During that time, most of the subjects in this study managed to complete the SSD, but some subjects took longer (up to 8 minutes). The potential weakening of induction effect may be considered a limitation of the study design.

However, examination of the subjects' responses did not show an appreciable decline in the severity of their experiences towards the end of the completion of the SSD. If there had been such a fast decay effect in the intensity of dissociation, one might have expected the scores on the hypermnesia subscale (the last of the 7 subscales in the SSD) to be lower than those for the preceding subscales. Such a reduction in the intensity of dissociation would then have had to be weighed up against the possibility that the dissociative symptom profile for patients with complex partial epilepsy might only include low levels of hypermnesic symptoms. However, this sample did not show appreciably lower scores on the hypermnesia subscale of the



SSD as compared to the other subscales. On the contrary, the scores of the patients with a right-sided epileptic focus on the hypermnesia subscale were higher across all experimental conditions than for any other SSD subscale, and much higher than the scores of the patients with a left-sided epileptic focus (Figure 9.4.4, Chapter 9). Therefore, the results of this study provided no evidence for a decay of dissociative experiences towards the end of the completion of the SSD.

At the end of the completion of each SSD, it usually took a few minutes for the subjects to be “grounded” and for their mental state to return to baseline levels, before the next experiment was started. On observation, subjects who needed very little in the line of grounding also had not reacted or had reacted with very little dissociation to the stimulatory procedures.

The administration of the SSD can therefore be considered to have been concurrent with the recording of the EEG. If in future studies the length of the SSD and the resultant time required for completion become a drawback in the process of concurrent data collection, the SSD might fruitfully be shortened to overcome the problem, provided that the shorter version is subject to repeat psychometric validation.

## ***10.2 The concurrent EEG correlates of dissociative states***

The most meaningful results emerged from the canonical analyses. Note that the method of canonical analysis is quite a robust analysis. In other words, it will identify the correlation between two sets, consisting of two different kinds of variables, as significant only when the “order” of the variables in the one set also correlates significantly with the “order” of the variables in the other set. A significant canonical correlation thus indicates a true effect.



### *10.2.1 Amnesia correlates canonically with theta EEG activity during hyperventilation*

The results suggest an association between the dissociative symptoms of amnesia, depersonalisation, and hypermnesia on the one hand, and theta activity on the other, and this association was specific to the condition of hyperventilation. This association raises the possibility that these three subscales may belong together in a subgroup of dissociative symptoms characterised by the EEG correlate of theta activity, as hypothesised at the beginning of this study, and suggested by the literature (Chapter 1 of this thesis; Spiegel & Vermutten, 1994; Ray et al., 1994).

This result could not be explained only by the higher levels of theta power in the patients with a right-sided epileptic focus (and in particular by the higher levels of theta power at their right-sided electrodes) as compared to the patients with a left-sided focus, because the canonical correlations were statistically significant at several of the electrodes. Moreover, in the case of the amnesia subscale, the canonical correlations were significant at all nine of the electrodes that were considered in this study, and even more significant at some of the left-sided electrodes. Nevertheless, the contribution of the different levels of theta power in the different subgroups needs to be controlled in future studies (see also Chapter 11).

Considered on its own, the relationship in this study between dissociative symptoms of amnesia, depersonalisation, and hypermnesia on the one hand, and theta activity on the other - a relationship that is diffuse instead of focal - might be related to the cerebral metabolic changes induced by hyperventilation.

However, when these results are considered alongside those by Sabourin et al. (1990), a different interpretation is possible. In their study, highly hypnotisable



subjects had more theta activity than low hypnotisable subjects at several electrodes (a diffuse phenomenon) during all the experimental conditions. However, both high and low hypnotisable subjects in their study showed significant increases in theta activity between initial wakefulness and subsequent hypnosis. Hyperventilation did not feature anywhere in their experiments. Theta activity therefore appears to be associated with the hypnotic state in their study. Perhaps the same is happening in this study, i.e. that the amnesia / theta relationship is not merely a metabolic phenomenon, but a specific feature of dissociative states.

#### *10.2.2 Identity confusion (in particular) correlates canonically with alpha and beta EEG activity during photostimulation @ 4 Hz*

The results suggest an association between the dissociative symptom of identity confusion and widespread fast wave activity, and the association was the most prominent during the condition of photostimulation at 4 Hz. To a lesser extent, a similar association was found for other SSD subscales. Scatterplots were examined for outlying data that might have been responsible for this result, but none such was found. This association raises the possibility that the SSD subscale of identity confusion represents a subgroup of dissociative symptoms characterised by the EEG correlate of fast wave (i.e. alpha and beta) activity. This was an unanticipated result.

The significance of this result might be doubted, because photostimulation may result in tensing of the scalp muscles with subsequent artefactual fast wave activity. However, canonical analysis here tested the correlation of two sets of data over two sets of conditions. An increase in alpha and beta activity during photostimulation, therefore, must be associated with an increase in dissociation subscale score in order to yield a significant canonical correlation. Moreover, the



pattern does not appear during 14 Hz photostimulation where a similar or even greater degree of scalp-muscle tensing would have been expected.

This association concurs partly with the findings of a study done in Canada by J.S. Lawson et al. (personal communication) of increased beta activity on quantitative EEG in the frontal regions of patients suffering from dissociative disorders. Also, in a study by Sabourin et al. (1990), highly hypnotisable subjects showed significant asymmetry between left and right hemispheres with greater beta power on the left in comparison with low hypnotisable subjects. However, their beta power showed no response except for fading out gradually as the experiments progressed.

In order to provide a crude comparison between the association of dissociative experiences with fast-wave activity, and the association of dissociative experiences with theta activity, scatterplot matrices of amnesia scores against beta power at the right parietal electrode (p4) during three experimental conditions were juxtaposed with scatterplot matrices of amnesia scores against theta power at the same electrode and during the same experimental conditions (Figure 9.7.5). Both wavebands showed a positive linear relationship with the amnesia subscale at the p4 electrode, but the slope of the regression prediction line was steeper for the association with beta power than for theta power, especially during photostimulation at a frequency of 4 Hz. This finding supports the possibility that different processes are present, each of which predominates during certain experimental conditions and at certain electrodes.

In a similar way, the association between identity alteration and beta activity, and the association between identity alteration and delta activity were compared at the left frontal electrode (Figure 9.7.7). The identity alteration-beta relationship started to manifest during photostimulation at 4 Hz, whereas the identity alteration-delta relationship only developed fully during hyperventilation. These patterns might reflect



a role for different neurophysiological processes associated with the same symptom during different conditions.

### *10.2.3 Identity alteration correlates canonically with frontal delta EEG activity during hyperventilation*

The results suggest an association between the dissociative symptom of identity alteration and delta EEG activity at both frontal electrodes during the condition of hyperventilation. This result supports the finding by Cocker et al. (1994) on quantitative EEG analysis, of increased frontal delta activity in the hypnotically induced 'baby' alter identity of a single patient with dissociative identity disorder.

The small sample size in this study precluded further canonical analyses to determine whether the relationship between the identity alteration subscale of the SSD and frontal delta activity during the hyperventilation condition was unique to one of the subgroups, i.e. to patients with a right-sided or a left-sided epileptic focus.

From Figure 9.7.7 can be seen that the slope of the regression prediction line referring to the relationship between delta activity and identity alteration at the left frontal electrode, increased gradually during the mirror experiment and the photostimulation experiments, and then suddenly increased dramatically during hyperventilation. This may suggest a possible role for a switch mechanism when the stimulus for dissociation became large enough.

### *10.2.4 Depersonalisation correlates canonically with several EEG variables*

The depersonalisation subscale of the SSD showed several significant canonical correlations with several wavebands during several experimental conditions at several



electrodes. Depersonalisation might represent a complex symptom that needs to be studied further in similar ways to the above. It might turn out that the depersonalisation subscale represents a heterogeneous group of symptoms, each with its own neurophysiological correlates.

#### *10.2.5 There may be a link between hypermnesia and focal epileptiform EEG activity*

This initial study of concurrent EEG correlates of dissociation in patients with complex partial epilepsy presented an opportunity to examine the possible relationship between dissociative experiences and epileptiform EEG activity (cf. Chapter 8, section 8.2.2). The results of this study suggest an association between the dissociative symptom of hypermnesia (and to a lesser extent amnesia and depersonalisation) on the one hand, and general activity (in all four wavebands) at the right mid-temporal (t4) electrode on the other hand, and this association was not specific to any of the experimental conditions (Chapter 9, section 9.6.2).

This relationship was apparently independent of the experimental design, and since the relationship was maximal in the area of the epileptic focus, the relationship might possibly be dependent on the subjects' diagnosis of complex partial epilepsy. Furthermore, this association might be a reflection of the right temporal seizure activity (or associated background EEG abnormalities) of the 7 patients with a right-sided epileptic focus. The background EEG changes associated with seizure activity or preceding seizure activity (as a recruiting rhythm) might include slow-wave activity in the region of the epileptic focus (Zifkin & Cracco, 1990; Daly, 1990).

The finding that two methods regularly employed in routine EEG recordings to facilitate the recognition of epileptiform features on the EEG, viz. photostimulation



and, even more so, hyperventilation, both precipitated dissociative experiences, is another pointer towards a role of epileptiform EEG activity in the neurophysiology of dissociation.

Unfortunately the subgroups (7 right-sided and 4 left-sided epileptic foci) were too small for meaningful differential canonical analyses, so that the hypothesis of an association between flashbacks or hypermnesic phenomena (or other dissociative symptoms) and seizure activity could not be fully tested (cf. Chapter 8, section 8.2.2).

#### *10.2.6 The concurrent EEG correlates of dissociative states: summary*

These results do not contribute towards an integrated explanation of the relationship between dissociation and EEG activity. However, these results do show that more than one kind of electro-encephalographic phenomenon is involved during these experiments.

Ictal-type EEG phenomena may play a role in hypermnesic symptoms. Metabolic changes in the brain associated with hyperventilation may play a role in amnesic symptoms. Frontal delta activity may play a role in the dissociative symptom of identity alteration. The latter does fit in with the traditional “localisation” of a person’s executive function in the frontal areas of the brain (Lishman, 1987) and the idea that a disruption of that normal function may manifest as a disruption in that person’s presentation of their executive identity.

Beta activity (especially parietally) may play a role in the dissociative symptom of identity confusion. However, the discrepancy in this study between the EEG correlates involved with identity confusion and identity alteration symptoms challenges the notion that identity alteration is a more severe form of and a natural



successor to identity confusion. These 2 symptoms might rather be different kinds of symptoms.

Depersonalisation might represent a complex symptom that does not fit neatly into one of the above categories, but instead shows features of most of the above relationships.

The above relationships between dissociation and EEG activity call for further studies of concurrent EEG correlates of dissociative experiences in patients with various disorders, inclusive of epilepsy, dissociative disorders, or other psychiatric disorders, and in control subjects.

This study of the concurrent EEG correlates of dissociation has been different from previous studies (cf. section 8.2.2) in a few respects. First, the SSD made it possible to measure dissociative states. Second, EEG activity was quantified, unlike in most of the previous studies. Third, the above two features made it possible to study the *concurrent* EEG correlates of dissociative states for the first time. Fourth, canonical correlations were performed on “dissociation-EEG data” for the first time. Fifth, although the sample size of 11 patients was too small for more extensive analysis, it was more than some of the previous studies, which were single case reports.

### ***10.3 Clusters of dissociative experiences and concurrent EEG correlates***

The SSD subscale scores did not all show the same relationship to the EEG data, for example, the amnesia subscale correlated with theta activity, whereas the identity confusion subscale correlated with beta activity. At this stage, the various associations with various EEG wavebands do not lend themselves to an integrative explanation of



the relationship between dissociation and EEG activity. This might suggest the SSD subsumes various clusters of dissociative symptoms, each with unique EEG correlates.

Furthermore, one of the SSD subscales, depersonalisation, might itself represent a heterogeneous group of symptoms. The depersonalisation subscale showed several significant canonical correlations with several wavebands during several experimental conditions at several electrodes. Depersonalisation might represent a complex symptom that needs to be studied further in similar ways to the above.

#### ***10.4 The SSD and the DES measure two aspects of the same phenomenon***

In this study the patients with complex partial seizures did not show a higher than normal prevalence of dissociative experiences, as measured by the DES, whereas their SSD scores indicated higher than normal levels of state dissociation, which also fluctuated according to experimental induction of dissociation.

The mean DES score of 9, and the 95% confidence intervals of the total CPE study population, and of the patients with a right-sided and left-sided epileptic focus considered separately (Table 9.1.3), were similar to those of the control subjects in the psychometric validation (Chapter 6, Figure 6.5.2). The near-normal DES scores of these patients with complex partial epilepsy, therefore, did not confirm that this sample of patients experienced a higher than normal prevalence of dissociative experiences, as suggested by the literature (Schenk & Bear, 1981; Mesulam, 1981). However, the results of this study (median DES score of 9.64) are comparable to those of a study by Devinsky et al. (1989), where the median DES score for 71



patients with epilepsy (12 with generalised seizures and 59 with complex partial seizures) was 8.75, and a study by Loewenstein & Putnam (1988), where the median DES score for 12 male patients with complex partial seizures was 6.8.

In contrast with the similarity between DES scores of this sample and DES scores of the control subjects in the psychometric validation, the SSD scores of the patients in this study were greater than those of the control subjects in the psychometric validation of the SSD. This study demonstrated that the state and trait characteristics of dissociation, as measured by the SSD and DES respectively, are not necessarily present to the same degree in a given population. This, and the sensitivity to experimental induction, supports empirically the claim in Chapter 1, of a distinction between state and trait characteristics of dissociation.

A further interpretation of the normal or near-normal levels of trait dissociation and increased levels of state dissociation (after experimental induction) in the patients with complex partial seizures, may be that patients with complex partial seizures experience more peri-ictal dissociative experiences rather than interictal dissociative experiences. This might also help explain a possible association between the more ‘paroxysmal’ dissociative symptoms such as flashbacks or other hypermnestic symptoms, and temporal lobe seizure activity (see section 10.2.5).

## ***10.5 Methodological limitations in the study of the concurrent EEG correlates of dissociative states***

### ***10.5.1 Sampling problems***

The subgroups of patients with right-sided and left-sided epileptic foci were too small to allow for meaningful differential analyses. Also, the subgroup of patients with a



left-sided focus was about half the size of the subgroup of patients with a right-sided focus. The result of this imbalance is that the results of this study might be considered mainly a reflection of the experiences and EEG activity of patients with a right-sided focus. The results from the patients with a left-sided focus appeared less clear-cut and sometimes to contrast with those from the patients with a right-sided focus. The results of this study might therefore have been more conclusive had only patients with a right-sided focus been included.

Another methodological limitation was that only one sample was used, and that their results could not be compared with a control group or other clinical samples (cf. section 10.1.1.3).

#### *10.5.2 Methodological problems in induction of dissociative states*

The doubt about the effectiveness of mirror staring to induce all or most of the dissociative experiences has been discussed above (cf. section 10.1.1.2). Photostimulation did induce dissociative experiences, but the exact effect varied according to the frequency of stimulation. The frequencies of 4 Hz and 14 Hz for photostimulation had been chosen on the grounds of possible recruitment of similar frequencies (cf. Chapter 8, section 8.5.2.2 and 8.5.2.3). Future studies might rather assess the induction effects of frequencies around the middle of each of the delta, theta, alpha, and beta ranges.

#### *10.5.3 Problems concerning the experimental procedure*

The order of the experiments might have played a role in the levels of dissociation that were carried over from one experiment to the next, despite the procedure of monitoring and “grounding” of the subject’s mental state. The effective hyperventilation experiment was probably best placed at the end of the data



collection. However, the less effective mirror experiment might have had a detrimental effect on the subject's dissociative response even to the subsequent photostimulation experiments. The mirror experiment may, therefore, be dropped from future studies.

#### *10.5.4 Problems concerning EEG data processing*

The Brain Atlas software automatically summed the power of each sampled frequency into 4 wavebands at set frequency intervals, where the beta band only consisted of frequencies between 12 and 15.5 Hz, and where faster frequencies were therefore excluded from analysis. In addition, technical aspects of the data collection resulted in the filtering of frequencies above 15 Hz for 8 of the 11 patients for some of the time, which further limited the fast frequencies available for analysis. These technical aspects of the data collection resulted in the availability of only a very narrow band of beta power for analysis. This needs to be addressed in further studies of the relationship between beta activity and dissociative symptoms. It could be addressed by converting the EEG data to ASCII files and manually summing them into more accurate wavebands, that is to say if the same equipment were used in future studies.

#### *10.5.5 Confounding variables*

The effect of medication on the EEG and on the SSD responses of the subjects was not controlled, since this part of the thesis was designed only as a (further) test of the sensitivity of the SSD to short-term changes in the intensity of dissociation, this time after experimental induction, and as an initial exploratory study of the relationship between dissociation and EEG correlates within a single sample.

It may be said, though, that all the subjects were receiving anticonvulsant medication (and one also received insulin), so that within this sample, no differences



could have arisen between medicated and unmedicated patients. The patient who also received insulin was not responsible for outlying data in any of the analyses. Also, the sample size was too small to allow for an examination of possibly diverse effects of anticonvulsant medication. The known effects on the EEG of anticonvulsant medication include diffuse slowing of the EEG with an increase in paroxysmal EEG activity (Niedermeyer & Lopes da Silva, 1987). In addition to the above effects, carbamazepine may result in a reduction of alpha activity and fast beta activity superimposed on the slow waves (Niedermeyer & Lopes da Silva, 1987).

In this study, however, the anticonvulsant medication cannot be considered to have had a major effect. The subjects still showed significant reactivity to the experimental induction of dissociation in more than one subscale of the SSD, appreciable reactivity in the remaining SSD subscales, and significant reactivity in all the EEG wavebands, and especially in the slower frequencies.

The role of brain damage or brain surgery could not be assessed here either due to the small sample size. However, further and more extensive studies along these lines would need to set up controls for the effect of medication and other confounding variables such as brain damage, brain surgery, comorbid psychiatric illness, and age.

#### *10.5.6 The confounding role of hyperventilation*

It might be said that hyperventilation represents another confounding factor in the study of the simultaneous relationship between dissociative experiences and EEG activity, because one of the main effects of hyperventilation (mediated via physiological changes) on the EEG is an increase in slow-wave activity. However, as discussed earlier, canonical analysis is quite a robust measure of the correlation



between two sets of variables. If a canonical correlation coefficient is statistically significant, it indicates a true relationship between the two sets of variables.

### *10.5.7 Choice of analytical methods*

#### **10.5.7.1 SSD-EEG correlations at each experimental condition**

The SSD-EEG correlations at each experimental condition (Tables 9.2.1 - 9.2.18; Table 9.3; Figures 9.6.1 - 9.6.4) were expected to give an initial indication of possible links between dissociation and concurrent EEG correlates. However, it turned out they were not very helpful in the assessment of the relationship between the SSD variables and the EEG variables, since they took no account of the size of the experimentally induced change in each variable.

#### **10.5.7.2 Canonical analysis of the relationship between SSD data and EEG data**

A few problems were associated with the use of canonical analyses in this study. First, the SPSS software (which was used extensively in the rest of the analyses) offered an OVERALLS-analysis that could handle several sets of variables, but unfortunately it required categorical data, which made the facility unsuitable for use in this study. Second, although the facility for canonical analysis offered by the STATISTICA software could handle continuous data, and was therefore used here, this program could only handle 2 sets of variables at a time. It was, however, actually more suitable, because the experiments were designed to stand separately, not as a progressive series over time. A third problem marred the analyses: each canonical analysis had to be specified individually by hand, since the software did not include the



facility to create a matrix of canonical correlations, thus resulting in a very time-consuming process.

### ***10.6 Limitations of design in this study of EEG correlates***

This study examined only dissociative experiences, but future studies might also examine the relationship between other psychiatric symptoms and concurrent EEG activity. Similarly, this study examined only EEG correlates, but future studies might also examine the relationship between dissociative symptoms and other concurrent neurophysiological parameters such as blood flow or glucose metabolism.

In this study, little visual examination was done of the analogue EEG data. Such visual examination would enhance future studies of the relationship between dissociative states and epileptiform EEG activity.



## *Part IV - Conclusions*

### 11

## Overview and future developments

State characteristics of dissociation were examined in the development and psychometric validation of the SSD and in the study of concurrent EEG correlates of experimentally induced dissociative states. An overview of this investigation includes a consideration of the limitations of this research in planning future developments.

The state and the trait characteristics of dissociation were highlighted by a systematic examination of durational aspects of dissociative experiences (Chapter 1). The presentation of the more apparent state and trait aspects of dissociation in a systematised way served the additional purpose of introducing ‘dissociation’ as a collection of particular disorders, as particular symptoms (of dissociative and non-dissociative disorders), and as certain mental phenomena.. Chapter 1 emphasised the presentation of most of the dissociative disorders as transient ‘states’, notwithstanding the trait-like aspects of some dissociative disorders, and it reviewed the literature on neurophysiological correlates of dissociative experiences.

From the review in chapter 1, a need was evident for scientifically accountable ways to study the state characteristics of dissociation. To this end, three complementary ways were suggested, drawing on standard psychiatric research practice: first, the assessment of existing measures of dissociation for state and trait characteristics; second, the development and psychometric testing of a measure of dissociative states, and the use of such a state-measuring instrument in clinical



samples; and third, a study of neurophysiological states concurrent with the dissociative states.

### ***11.1 Existing measures address predominantly trait characteristics of dissociation***

The existing measures of dissociation were described, based on a literature review of these measures (Chapter 2). The examination of existing measures of dissociation revealed measurement of different aspects of dissociation, for example, personality trait-like aspects and more pathological aspects (whether state-like or trait-like). The assessment of the durational aspects of the existing scales showed that the previous measures of dissociation are restricted to the measurement of an enduring tendency to dissociate, or the lifetime prevalence of dissociation, or the frequency of dissociative experiences during a specified period in the past. Another shortfall observed was that the majority of the existing scales do not measure the severity or intensity of dissociative symptoms. None of the scales is sensitive to momentary (on-off) alterations or the short-term variability in the intensity and duration of dissociative symptoms, despite clinical suggestions of rapid switches in and out of or between dissociative states (DSM-IV, 1994; Putnam, 1989; Loewenstein, 1991; Beere, 1996; Ryle, 1997).

Since none of the existing scales could measure dissociative states at the time they occurred, none of these scales was suitable for a study of concurrent neurophysiological correlates of dissociative states. Since there was overwhelming evidence for state characteristics of dissociation (Chapter 1), a measure that would be sensitive for precisely these characteristics was necessary to examine them. Such a



measure would need to be sensitive to momentary alterations or the short-term variability in the duration as well as in the intensity of dissociative symptoms.

Thoroughly validated existing (trait) measures of dissociation provided good examples for the proper validation of the state scale. Their methodology, as well as the methodology followed generally in the psychometric testing of scales, was reviewed in chapter 3 as, first, guidance for the development and validation of the State Scale of Dissociation (SSD) and second, as an introduction to the validation concepts.

## ***11.2 Overview of the development and psychometric validation of the SSD***

A combination and serial use of the theoretical, itemetric, and criterion-group approaches at different stages of the development and psychometric testing allowed for an accountable theoretical basis, statistical soundness, and clinical relevance of the SSD.

The SSD was constructed by the transformation of items from previous measures of dissociation. The derivation of the SSD from existing measures of dissociation ensured that the construct of dissociation, as reflected in the SSD, represented a reasonable consensus of the domain of dissociation. This contributed towards its content validity. A framework of 7 subscales was drawn up for the selection and organisation of suitable items from the existing measures of dissociation. The 7 subscales of the SSD represented commonly quoted symptoms of dissociation. Five of the symptoms had informed the DSM-IV: derealisation, depersonalisation, identity confusion, identity alteration, and amnesia. Conversion symptoms were added in accordance with the ICD-10 approach of classifying the dissociative and the



conversion disorders together. Hypermnestic symptoms were added in accordance with the literature on trauma as an aetiological factor.

The limitation of the derivation of the SSD from existing measures of dissociation is that the 7-tiered framework merely represents a reasonable consensus of the domain of dissociation, as received from the literature and existing measures of dissociation. The seven categories are still surrounded by a fluid boundary. The SSD (prior to validation) goes no further towards a clear definition of the construct of dissociation. Symptoms that overlapped historically with the construct dissociation, such as somnambulism and other sleep-related symptoms; symptoms relating to the experience of time; as well as symptoms traditionally considered interictal manifestations of complex partial epilepsy, were excluded from the SSD in the interest of a clear focus, a shorter and more manageable scale, and contemporary accountability. Possible links between sleep-related symptoms (or any of the other groups of symptoms mentioned above) and the construct of dissociation (as subsumed in the SSD) could be tested in future studies.

The SSD was formatted and worded as a present-state self-report measure in order to measure dissociative experiences at the time that they occurred, and thus to be a state measure of dissociation. The subjective nature of many dissociative experiences (especially when they are mild to moderate) may make them unnoticeable to an observer. Therefore, the preferable way to measure those experiences at the time that they occur, was to rely on a subject's self-report. However, in some severe instances of dissociation such as a fugue, a self-report measure might be an unreliable reflection of the patient's inner experience. Therefore, an important limitation of the self-report format of the SSD is that it might exclude the assessment of some patients.



The graded scoring system of the SSD allowed it to be sensitive to the intensity of dissociative experiences. The simple instructions and plain visual layout of the SSD contributed towards its user-friendliness.

The process of item selection and item revision (cf. Chapter 5, the pilot study) occurred through expert consultation (content validity) and the testing of internal criterion-related validity. Items that did not contribute towards a measurement of dissociation were reworded in order to increase their sensitivity to measure dissociative symptoms.

The broad validation strategy that was followed, is a strong point of the SSD. It enriched the evidence for the validity and reliability of the SSD, more than that afforded by standard testing of little more than Cronbach's alpha coefficients and test-retest reliability coefficients, as had been done for some of the existing measures of dissociation.

The SSD was demonstrated as a valid and reliable measure of the severity of dissociation experienced at the time of completion of the scale. First, it is valid. That is, it measures what it is supposed to measure, by virtue of its derivation from existing measures of dissociation (its content validity); its ability to distinguish between people who dissociate and people who do not dissociate (its concurrent validity); the high correlations between its item scores and subscale scores with the total SSD score (its internal criterion-related validity); its construct validity on factor analysis where all the subscales were demonstrated to measure core dissociation; its satisfactory correlation with the DES (its convergent validity); and its lack of overlap with other constructs (its discriminant validity) when compared to the BDI, BAI, and PANSS). Second, it is reliable. That is, it is relatively free from measurement errors by virtue of its high internal consistency and its high split-half reliability. Third, the SSD is what it was



designed to be - a state scale of dissociation - by virtue of its sensitivity to the temporal variability of dissociation.

In addition to demonstrating that the SSD could distinguish between people who dissociate and people who do not dissociate, the testing of the concurrent validity of the SSD also confirmed the sensitivity of the SSD to the severity of dissociation at the time of completion of the scale. The concurrent validity was tested in contrasting samples (patients with a dissociative disorder, a major depressive disorder, schizophrenia, alcohol withdrawal, and a control group) and the results demonstrated that the SSD could distinguish between people with higher degrees of dissociative experiences and people with lower degrees of dissociative experiences. The results concurred with the theoretical expectation based on the literature that the patients with dissociative disorders would experience the highest intensity of dissociation and that the other clinical subjects would experience a higher intensity of dissociation than the control subjects.

Factor analysis was used in two ways in the psychometric validation of the SSD. First, internal factor analysis confirmed the construct validity of the SSD and showed that the SSD and all 7 subscales measured core dissociation. To some extent, the factor analysis also supported the subscale structure of the SSD. It did not support the DSM-IV segregation of conversion disorders from dissociative disorders. Second, the testing of the discriminant validity of the SSD by external factor analysis, i.e. factor analysis of pooled item scores from various scales, showed that the construct of dissociation as measured by the SSD did not overlap with the concepts of depression (as measured by the BDI), anxiety (as measured by the BAI), or “psychosis” (as measured by the PANSS).



The sensitivity of the SSD to changes in the intensity of a person's dissociative symptoms was evident both from the pilot and from the full psychometric validation. The psychometric validation of the SSD confirmed the ability of the SSD to measure a change in the dissociative status of psychiatric patients and control subjects after the administration of four other psychiatric scales (viz. DES, BDI, BAI, and SCI-PANSS). The difference between the scores on the first and second administrations of the SSD was statistically highly significant. The sensitivity of the SSD to changes in the intensity of dissociation was also tested after experimental induction (see below under section 11.3).

The method of testing the convergent validity of the SSD (a state measure) with the DES (a trait measure) was not ideal, yet inevitable, considering the lack of another state measure of dissociation. Nevertheless, the convergent validity between the SSD and the DES suggested that the two different scales measured aspects of the same phenomenon (see also below under section 11.4).

The main strength of the SSD is also its main limitation: its clinical usefulness is limited to an immediate assessment of the intensity of dissociation at the time of completion of the questionnaire, and therefore the SSD has limited diagnostic predictive value. The SSD identifies people who are "actively" or acutely dissociating, irrespective of the presence or absence of a psychiatric or other diagnosis. The format of the SSD does not allow for the gathering of information on the longitudinal course of someone's dissociative symptoms, and therefore the SSD could not be used for the diagnosis of, for example, the dissociative disorders. This limitation was a deliberate payoff in the interests of user-friendliness and measuring present states. The testing of the predictive validity of the SSD confirmed this limitation of the SSD. The likelihood ratio and post-test odds demonstrated a 10-times-higher certainty of a diagnosis of a



dissociative disorder if the SSD score is  $\geq 3.9$ . However, since the prevalence of the dissociative disorders is relatively low (here taken to be 5 - 10 %), and the post-test odds (for both of those values of prevalence) were greater than the relevant positive predictive value, an SSD score  $\geq 3.9$  would still mean the person is more likely not to suffer from a dissociative disorder than to suffer from a dissociative disorder. At most, therefore, the SSD could be used in screening for the presence of a dissociative disorder.

The measurement of concurrent symptomatology in various diagnostic groups during the psychometric testing of the SSD has also led to original contributions to research on dissociation. First, the testing of the SSD demonstrated the comorbidity between dissociative symptoms and depressive symptoms (both quantified) in patients with dissociative disorders. However, less comorbidity was evident in the patients with a major depressive disorder despite the literature reporting that patients with major depressive disorders suffer from dissociative symptoms at times in addition to their mood symptoms (Kaplan & Sadock, 1995; APA, 1994). This may be reconciled with the findings of the present study by future studies of the relationship between dissociative and depressive symptoms in a variety of patients with a major depressive disorder, who have different subtypes of depressive symptom constellations.

Second, the psychometric testing of the SSD demonstrated an overlap of symptoms between patients with a dissociative disorder and patients with schizophrenia. Although one might have anticipated that identity alteration would be quite specific to patients with dissociative disorders, the results suggested the contrary in that identity alteration as measured by the SSD also featured prominently in patients with schizophrenia. This result was interpreted to mean that the identity alteration items in the SSD show a degree of potential overlap with delusions of being



controlled, and that the high scores on identity alteration by some of the patients with schizophrenia may reflect their delusions of that kind. Psychotic symptoms as measured by the PANSS were also responsible for overlap between these two patient groups. Comparisons between their PANSS scores confirmed previous observations of especially positive psychotic symptom overlap between patients with dissociative disorders and patients with schizophrenia. In addition, these findings might suggest that negative symptoms are important in the distinction between schizophrenia and dissociative disorders. But despite the fact that the patients with dissociative disorders and schizophrenia share symptoms, and despite untested hypotheses about the link between these symptoms, the constructs of dissociation and “psychosis” were demonstrated as distinct from one another, as evidenced by the external factor analysis where the SSD items and the PANSS items clustered into separate uncorrelated factors.

The development and testing of a state-sensitive scale itself served as a way of examining state features of dissociation in at least two ways. First, the development of the SSD was based on past studies of dissociative experiences with particular highlighting of state-like features, and second, the psychometric testing of the SSD in clinical samples revealed more about the dissociative states in those samples. Furthermore, the subsequent state measure made it possible for the first time to study the concurrent neurophysiological correlates of measured dissociative states.

### ***11.3 Overview of the concurrent EEG correlates of dissociation***

With the SSD at hand, state characteristics of dissociation could be studied further by an examination of electro-encephalographic (EEG) states concurrent to the dissociative states. This study of the EEG correlates was designed as an initial search



for the EEG correlates of dissociation in a single sample, thus slightly more than a feasibility study, with a view to more extensive future studies of the EEG correlates in larger samples, contrasting clinical samples, and control samples. Moreover, the sample size for this study was small (11 patients with complex partial epilepsy) in the interests of a practically manageable study within the time constraints of this research. Patients with CPE were chosen on the basis of numerous previous reports of dissociative symptoms in these patients (Lishman, 1987; Bancaud & Talairach, 1992; Broglin et al., 1992; Wieser et al., 1992; Luciano, 1993; Schenk & Bear, 1981).

The study of the concurrent EEG correlates of dissociation featured strengths not found in previous related studies. First, the SSD made it possible to measure dissociative states at the time they occurred. Second, EEG activity was quantified unlike in most of the previous studies. Third, the above two features made it possible to study the *concurrent* EEG correlates of dissociative states for the first time. Fourth, for the first time canonical analysis was performed on “dissociation-EEG data” in order to examine correlations between the different sets of data. Fifth, although the sample size of 11 patients was too small for more extensive analysis, still it was larger than in some of the previous studies, which were single case reports.

The main limitations of the study of the EEG correlates concerned the design of the study, and in particular problems relating to confounding variables. The small sample size precluded an adequate statistical analysis of the effects of the confounding variables in this study. One potential confounding factor was recent seizures, especially subclinical ictal activity. To circumvent this problem, subjects who had admitted to recent seizures were excluded. The anticonvulsant medication (and, in one case, antidiabetic medication as well) that the subjects used might be a confounding variable. However, anticonvulsant medication usually results in slowing of the EEG,



and at least some of the significant canonical correlations did not concern slow EEG activity (see below). Further and more extensive studies of the EEG correlates of dissociation would need to control for the effect of other possible confounding variables such as brain damage, brain surgery, comorbid psychiatric illness, and age.

The method of studying the EEG correlates of dissociation depended on concurrent measurement of dissociative states (by the SSD) and EEG, after experimental induction of dissociation. Dissociative states were induced experimentally in four ways (discussed later under this section) and the SSD was administered concurrently with EEG recording after each experiment. Digital EEG signals were converted to a frequency domain using a Fast Fourier Transform (FFT). The method of spectral analysis separated the waveform into its different frequency components and the data were plotted as power spectra.

The four different methods of induction did not all have similar merit. The mirror-staring experiment was less successful in inducing dissociation than anticipated (cf. Miller et al., 1994). However, it was mostly the subgroup of patients with a left-sided epileptic focus who did not react to the induction by staring into a mirror. Such a possible difference between subgroups would need to be replicated in larger samples along with control subjects. Otherwise, the mirror experiment could be dropped from future studies.

Photostimulation at a frequency of 4 Hz resulted in higher-than-baseline levels of dissociative experiences in most patients. However, compared to the preceding mirror-staring experiment, the SSD scores actually dropped somewhat in some cases. Another non-yield of this experiment was the apparent lack of a synchronisation response. The significant canonical correlations during this experiment involved beta activity, and not theta activity as anticipated. Photostimulation at a frequency of 14



Hz did not result in prominent increases in dissociation either. On the contrary, many of the patients actually showed a lower intensity of dissociation during this experiment. Similarly with the photostimulation at 4 Hz, there was no clear synchronisation response during this experiment. Instead of limiting photostimulation to frequencies of 4 Hz and 14 Hz, future studies might better assess the induction effects of frequencies around the middle of each of the delta, theta, alpha, and beta ranges.

The hyperventilation experiment demonstrated the most prominent effect on the intensity of dissociation in all subjects. This might be related to the cerebral metabolic changes induced by hyperventilation, i.e. hypocarbia, cerebral vasoconstriction, and an altered metabolic rate of the neurones, along with resultant slowing of the EEG.

A concern might be the potential fast decay of the induced dissociative response and EEG response after the end of each experimental induction procedure. The EEG usually returns to its baseline level about 2 to 3 minutes after the cessation of hyperventilation (Daly & Pedley, 1990). The effect on the EEG of photostimulation is usually evident during the photostimulation, and does not necessarily last long after the cessation of photostimulation. No studies of the effect of staring into a mirror on the EEG have been identified. The duration of an experimentally induced dissociative state has not been studied either, owing to the lack until now of a state scale of dissociation. The concern is that by the time the subject gets to the last SSD items (i.e. between 3 - 8 minutes after the end of the experiment), the experimentally induced EEG changes (if any) and dissociative symptoms (if any) might have dissipated.



However, decay of the experimentally induced responses did not appear to be a problem in this study. The consistently high scores on the hypermnesia subscale of the SSD (the last subscale on the SSD), at least by the patients with a right-sided epileptic focus, tend to reassure that there was no appreciable decay effect on the dissociative state between the end of each experimental induction procedure and the completion of the SSD. This occurred despite gradual normalisation of the EEG during the time of completion of the SSD. Moreover, canonical analysis yielded several significant SSD-EEG correlations for the hyperventilation condition. If, in future studies, the length of the SSD and the resultant time required for completion becomes a drawback in the process of concurrent data collection, the SSD might fruitfully be shortened to overcome the problem, provided that the shorter version is subject to repeat psychometric validation.

The sensitivity of the SSD to experimentally induced changes from the baseline in the intensity of dissociative experiences was examined across the 4 experimental conditions in this study. The Friedman test indicated significant differences among the distributions of depersonalisation scores during the different experimental conditions, and among the distributions of conversion scores during the different experimental conditions. Future studies of the sensitivity of the SSD to temporal variability in the intensity of dissociation might be conducted in different patient samples and control subjects, since the sensitivity may depend on the study population rather than on the SSD. Future studies might also analyse the principal components at the baseline and on the next occasion (for example, after experimental induction of dissociation), comparing the factor structure at both points (Salvador-Carulla, 1996).



The relationship between the set of SSD variables (which changed over the 5 experimental conditions) and the set of EEG variables (which changed over the 5 experimental conditions) was examined by canonical analysis. The canonical analyses demonstrated several significant (simultaneous) relationships between dissociative experiences and concurrent EEG activity, some of which were dependent on experimental induction of dissociative experiences, and some of which were independent of experimental induction. The number of significant relationships was surprising in the light of the small sample size.

The relationships that depended on experimental stimulation included an association between amnesia and theta activity. Metabolic changes in the brain associated with hyperventilation may play a role in the induction of amnesic symptoms. During hyperventilation as well, the results demonstrated an association between identity alteration and frontal delta activity. In contrast, the dissociative symptom of identity confusion was associated with widespread fast wave activity, especially during photostimulation at 4 Hz. The discrepancy in this study between the EEG correlates involved with identity confusion and identity alteration symptoms challenges the notion that identity alteration is a more severe form of and a natural successor to identity confusion. Rather, these two symptoms might be different kinds of symptoms.

The relationships which were independent of experimental stimulation, included an association between hypermnesia and general EEG activity at the right mid-temporal (t4) electrode, regardless of experimental condition. Hypermnesia represents one of the more paroxysmal groups of dissociative symptoms, and the t4 electrode was the nearest electrode to the anatomical site of the epileptic focus of the



majority of the patients with CPE in this study. This highlights a possible role for ictal-type EEG phenomena in hypermnestic symptoms.

Still independent of experimental stimulation, the depersonalisation subscale of the SSD showed several significant canonical correlations with several wavebands during several experimental conditions at several electrodes. Therefore, it may be proposed that depersonalisation represents a complex symptom which needs to be studied further.

At present, the various associations between various dissociative experiences and various EEG wavebands do not lend themselves to an integrative explanation of the relationship between dissociation and EEG activity. Juxtaposition of more than one set of results suggested that different processes or EEG phenomena might be present, each of which predominates during certain experimental conditions and at certain electrodes. These results might also suggest that unique EEG correlates pertain to various clusters of dissociative symptoms as measured by the SSD.

The relative lack of visual examination of the analogue EEG data limited the examination of a possible relationship between dissociative states and epileptiform EEG activity. If such a relationship existed, the question would arise whether the dissociative symptoms as measured by the SSD are ictal or peri-ictal phenomena. Photostimulation and hyperventilation are routinely used during EEG recording to facilitate the emergence of underlying epileptiform features. The expectation would be that these stimulatory procedures would have the same effect in the patients with CPE in this study. Such emergence of epileptiform features was not visually analysed in this study but would have coincided with the other changes in EEG activity as quantified during spectral analysis of the digital EEG. An alternative method of examining the relationship between dissociative states and epileptiform EEG activity would be the



simultaneous use of computer software that counts epileptiform spikes in patients with epilepsy. If significant canonical correlations were found between dissociative states and concurrent epileptiform activity in, say, the affected temporal lobe, the correlations would provide support for the idea that dissociative experiences in patients with CPE might be ictal or peri-ictal events rather than interictal events.

On the other hand, a possible relationship between dissociation and interictal EEG activity might be examined by the testing of the convergent or discriminant validity of the SSD against one or more of the epilepsy questionnaires (cf. Chapter 2, section 2.5.1.2.1). These questionnaires measure characteristics and behaviours which are commonly observed interictally in patients with epilepsy. However, current epilepsy questionnaires are trait measures, and the implications of comparing a state measure to a trait measure would need careful consideration, as they did in the psychometric validation of the SSD.

### ***11.4 State and trait characteristics of dissociation***

The *state* characteristics of dissociation were underscored by the successful development and psychometric validation of the SSD, and also by the study of the concurrent EEG correlates of dissociation. The SSD was demonstrated repeatedly to be sensitive to the temporal variability of dissociation (cf. sections 11.2 and 11.3). In the pilot study to the psychometric validation, the SSD was demonstrated to be sensitive to overnight changes in dissociative states of nurses working a night shift. In the psychometric validation proper, the SSD was shown to be sensitive to changes in dissociative states after the completion of 4 other psychiatric rating scales. In the study of concurrent EEG correlates the SSD was shown to be sensitive to experimentally induced dissociative states.



The different time or durational aspects of the phenomenon of dissociation have been referred to as states and traits in view of the existing measures of dissociation and other literature (Chapters 1 and 2). Existing scales such as the DES measured dissociative traits (the usual frequency of dissociative experiences), whereas the SSD measured dissociative states (the intensity of dissociative experiences at the time that they occur). States and traits had been presumed initially as aspects of the same phenomenon in Chapter 1, but this was later supported by the comparisons of the SSD and DES data (Chapter 10, section 10.4; Chapter 7, section 7.1.3.2).

The relationship between the state and the trait aspects of dissociation has been elucidated through the administration of the DES alongside the SSD in both of these studies, and the finding that the state and trait characteristics of dissociation are not necessarily present to the same degree in a given population. A consideration of the association between SSD and DES scores in the psychometric validation showed that some subgroups of patients experienced trait and state features of dissociation, whereas others experienced predominantly state features. The different patterns among the subgroups of the SSD and DES scores showed how transient dissociative states can be superimposed on a tendency (or a 'non-tendency') to those same dissociative experiences, during the course of psychiatric illnesses. In the study of EEG correlates, the patients with CPE also experienced dissociative states rather than traits: whereas their DES scores were near-normal and comparable to the DES scores of the control subjects in the psychometric validation, the baseline SSD scores of the patients with CPE were higher than those of the control subjects in the psychometric validation, and increased further after experimental induction.

Given that state and trait aspects of dissociation are not necessarily present to the same degree in a population or sample, it is anticipated that dissociative states (as



measured by SSD scores) might not necessarily be distributed normally in the general population, as dissociative traits (as measured by DES scores) are claimed to be distributed (Bernstein & Putnam, 1986). However, testing of the distributions of SSD scores among the various clinical samples in the psychometric validation (Chapter 6, section 6.1) and among the CPE patients in the study of EEG correlates (Chapter 9, section 9.1.2.2) provided no evidence against a normal distribution of the SSD scores.

Thus, dissociative traits (as measured by the DES) may be considered as lying on a continuum of frequency, and dissociative states (as measured by the SSD) could be considered as lying on a continuum of severity. An independent continuum of severity of state-like dissociative experiences (as measured by the SSD) would complement the continuum of the usual frequency of dissociative experiences, or the dissociative trait (as measured by the DES). The state continuum concerns the severity or intensity of dissociation at the time that it occurs, and the trait continuum refers to the usual frequency of dissociation over time. In other words, the state continuum addresses (cross-sectionally in time) the momentary or short-term variability in the intensity of dissociative experiences, whereas the trait continuum addresses (longitudinally) the variable course of dissociative experiences over time.

The idea of two concurrent but possibly independent continua of a single phenomenon, such as the state and trait continua of dissociation, is not entirely new to psychiatry. Chapter 1 (its introduction) pointed out that state and trait aspects of disorders had been studied for various psychiatric disorders, and especially for the mood disorders, although these previous studies usually made reference to state or trait “markers” of the various disorders. The DSM-IV mood disorder “specifiers”, which describe either the most recent mood episode or the course of recurrent episodes of mood disorders, distinguish between a cross-sectional and a longitudinal



grading system. The most recent mood episode is specified in terms of its severity (or other particular characteristics), whereas the course of recurrent episodes of mood disorders is specified in terms of patterns of occurrence over time. Both these kinds of specifiers are coded from a categorical series of descriptive terms. However, the two continua of dissociation differ from the above example of mood disorder specifiers in that both the state continuum and the trait continuum of dissociation are measured by continuous variables, which allow better distribution fitting than that afforded by the heterogeneous categories of the specifiers to DSM-IV mood disorders.

### ***11.5 Potential future applications of the SSD***

The SSD has potential utility in a variety of clinical settings. At admission to a psychiatric hospital or at outpatient assessment, the SSD might provide an instant assessment of the presence and severity of a range of dissociative symptoms at that time. During the assessment of a patient for psychotherapy, a rapid examination of the presence and severity of a range of dissociative symptoms might help in the understanding of a patient's difficulties and it may influence decisions regarding the planning of treatment. The SSD might also be used as an outcome measure of psychiatric treatment, whether the treatment was psychotropic medication or psychotherapy.

One of the next steps might be to use the SSD in a more extensive, revised protocol of this study of the concurrent EEG correlates of dissociation. This protocol might include patients with various disorders, inclusive of epilepsy, dissociative disorders, other psychiatric disorders, and control subjects. The subjects with epilepsy might be subclassified according to their type of epilepsy and, in the case of focal epilepsy, according to the site and the side of the epileptic focus. Each subgroup



would ideally contain at least 10 subjects in order to allow for canonical analyses in each subgroup.

In addition to the four induction experiments used in this study, chemical induction of dissociation might be considered, for example, by lactate infusion (similar to that used in patients with panic disorder to induce panic). The chemical induction effect of alcohol on dissociative experiences as measured by the SSD is already being studied at the Broadmoor Hospital, Crowthorne (J. Lumsden, personal communication).

Since canonical correlations form such an integral part of the study of the relationship between dissociative states and concurrent EEG correlates, (or any other potential correlates), a computer software package that could create a matrix of canonical correlation coefficients, in the same way that matrices of, for example, Spearman's rho correlation coefficients are calculated by standard statistical packages, would save much time.

In addition to studies of the concurrent EEG correlates of dissociation, the SSD might be applied to studies of other concurrent neurophysiological correlates of dissociation. For example, polysomnographic recordings might be used to study the relationship between sleep parameters on the one hand, and hypnogogic and hypnopompic dissociative experiences on the other hand. Extending the scope of potential correlates further, the options of functional magnetic resonance imaging, positron emission tomography, single photon emission computerised tomography, regional cerebral blood flow, and event-related potentials might all potentially be employed.

The SSD might be applied in further epidemiological research to examine the relationships and possible overlap or comorbidity between dissociative states and



other present-state psychiatric symptoms in patients with various psychiatric disorders and control subjects, along the lines of the psychometric validation of the SSD. The relationship between somatoform symptoms (other than conversion symptoms) and dissociation as measured by the SSD might extend this research. As mentioned under section 11.3 above, the co-administration of the SSD and an “epileptic measure” might also extend such epidemiological research to the field of epilepsy.

Quantified assessments of a person’s experience of time (cf. Melges et al., 1970, 1974) and sleep-related experiences (Janet, 1914, 1930) might be compared to the SSD. Psychometric testing of, for example, the convergent or discriminant validity of the SSD against such assessments would inform the construct validity of either scale and would help to clarify the relationship between the two constructs. Such a study of sleep-related experiences would revive the dormant work of Janet, who examined sleep-related symptoms under the blanket of what he coined ‘dissociation’.

Additional formats for the SSD might extend its utility. As mentioned above in section 11.3, a shorter version of the SSD might overcome the potential problem of decay of an induced experimental effect. A clinician-rated form of the SSD might overcome the unsuitability of the self-report SSD in dissociative stupor or problematic switching to alter identities where the subject is unable to complete a self-report measure reliably. The problem of transcultural validity of scales might be helped if the SSD were to be translated to other languages and psychometrically tested in the target populations. For repeated administrations of the SSD within short periods where learning or memorisation of items in the SSD might be undesirable, alternate forms of the SSD might be advantageous, provided that the reliability and the validity of each of the 2 forms were tested again. One might consider applying other time frames to the SSD. A formulation for experiences during the past week might be more



useful as an outcome measure of treatment, and a format of enquiry into the usual frequency of dissociative experiences, i.e. the development of a trait version concerning these 7 groups of symptoms, might facilitate a closer comparison between state and trait aspects of dissociation, again provided that these versions are psychometrically validated, since the DES does not correspond to the 7 groups of symptoms in the SSD.

In conclusion, clinical observations of dissociative *states* were confirmed empirically in the present research. The confirmation in research proved to be a worthwhile undertaking, rewarded by the acquisition of an asset - a valid and reliable scale that measures significant characteristics of dissociation. This tool might benefit clinical work and facilitate further research. In particular, the newly developed SSD allows for further investigation of the suggested state continuum of severity and trait continuum of frequency of dissociation in more comprehensive studies of concurrent neurobiological correlates. This would extend the scope of research in the field of dissociation and perpetuate the rewarding process of cross-fertilisation between clinical work and scientific research.



## *Appendix 1*

*SSD before psychometric validation (“Pilot-SSD”)*



Time of day \_\_\_\_\_

## SSD

**This questionnaire contains phrases about experiences that you may or may not have right now. For each statement, please tick the box corresponding to the intensity of your experience, as shown in this example:**

Not at all

☐ ☐ ☐ ☐ ☐ ☒ ☐ ☐ ☐ ☐

Very much so

**Read the statement in this column**

**Then answer in this column**

- 1 Things around me seem unreal or dreamlike.
- 2 Things around me look different from the way they usually do.
- 3 It is as if I am looking at things around me through a fog.
- 4 I feel far away from what is happening around me.
- 5 Things around me are looking smaller than they usually do.
- 6 Things around me are looking larger than they usually do.
- 7 I am in a world of my own.
- 8 I am in a trance.
- 9 My body feels vague, indefinite, strange.
- 10 My body seems disconnected from my thoughts, my feelings, my self.
- 11 It feels as if I am going through the motions of living, but the real me is far away from what is happening to me.
- 12 It is as if I am watching my body from the outside.
- 13 It feels as if parts of my body or my whole being is unreal.
- 14 My hands or feet or other parts of my body feel as if they have changed in size.
- 15 I feel like a stranger to myself.
- 16 My self-awareness seems different now: There seems to be either a greater or less difference between self and not-self.
- 17 I do not feel like my real self.
- 18 This is not me.
- 19 I do not know who I really am.

- [illegible]



- |      |   |            |  |              |
|------|---|------------|--|--------------|
| 20   | I do not feel like a whole person.  | Not at all | <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> | Very much so |
| 21   | There is a struggle going on inside of me.  | Not at all | <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> | Very much so |
| 22   | I feel torn between doing one thing and another.  | Not at all | <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> | Very much so |
| 23   | I am talking to myself silently.  | Not at all | <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> | Very much so |
| 24   | My inner voices are talking.  | Not at all | <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> | Very much so |
| <br> |   |            |  |              |
| 25   | I am split into more than one person.   | Not at all | <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> | Very much so |
| 26   | I am starting to feel like a different person now (for example a child).                                    | Not at all | <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> | Very much so |
| 27   | There is another person inside me waiting to come out and take control of my actions and speech.            | Not at all | <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> | Very much so |
| 28   | My alter ego is about to take over.   | Not at all | <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> | Very much so |
| 29   | I am not in control of myself now.  | Not at all | <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> | Very much so |
| 30   | I feel as if I am possessed by something or someone.  | Not at all | <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> | Very much so |
| 31   | I am not in control of my emotions right now.   | Not at all | <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> | Very much so |
| 32   | My mood is changing now (for example into anger, anxiety, happiness, or a feeling of cosmic consciousness). | Not at all | <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> | Very much so |
| <br> |   |            |  |              |
| 33   | I am unusually weak or paralysed in one or more of my muscles now.  | Not at all | <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> | Very much so |
| 34   | I cannot move, but I know what is going on around me.   | Not at all | <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> | Very much so |
| 35   | If I try to speak now, my voice will be gone or different from usually.                                     | Not at all | <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> | Very much so |
| 36   | I cannot control my speech now.   | Not at all | <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> | Very much so |
| 37   | It is as if I am wearing gloves or a body stocking which prevents me from feeling normally.                 | Not at all | <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> | Very much so |
| 38   | I have numbness in one or more places on my skin now.   | Not at all | <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> | Very much so |
| 39   | I feel as if I am going to faint now.   | Not at all | <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> | Very much so |
| 40   | I am going into a fit or a stupor.  | Not at all | <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> | Very much so |
| <br> |   |            |  |              |
| 41   | My mind feels blank.  | Not at all | <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> | Very much so |
| 42   | I am unaware of what is happening around me.  | Not at all | <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> | Very much so |
| 43   | I am having difficulty taking in new information.   | Not at all | <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> | Very much so |



- 44

I am forgetting what I want to do or say.

Not at all

☐☐☐☐☐☐☐☐☐☐☐☐

Very much so
- 45

I do not remember putting on these clothes.

Not at all

☐☐☐☐☐☐☐☐☐☐☐☐

Very much so
- 46

I am uncertain whether I actually responded with a tick to all the previous statements.

Not at all

☐☐☐☐☐☐☐☐☐☐☐☐

Very much so
- 47

I do not know what today's date is.

Not at all

☐☐☐☐☐☐☐☐☐☐☐☐

Very much so
- 48

I do not know exactly where I am.

Not at all

☐☐☐☐☐☐☐☐☐☐☐☐

Very much so
- 49

This situation feels as if it has happened before.

Not at all

☐☐☐☐☐☐☐☐☐☐☐☐

Very much so
- 50

It is as if I know what is going to happen next.

Not at all

☐☐☐☐☐☐☐☐☐☐☐☐

Very much so
- 51

I am remembering things that I have not thought about for some time.

Not at all

☐☐☐☐☐☐☐☐☐☐☐☐

Very much so
- 52

Unwanted memories are entering my mind.

Not at all

☐☐☐☐☐☐☐☐☐☐☐☐

Very much so
- 53

I am seeing a past event in my mind's eye right now.

Not at all

☐☐☐☐☐☐☐☐☐☐☐☐

Very much so
- 54

I am experiencing a flashback.

Not at all

☐☐☐☐☐☐☐☐☐☐☐☐

Very much so
- 55

It feels as if some past event is occurring again now.

Not at all

☐☐☐☐☐☐☐☐☐☐☐☐

Very much so
- 56

I am hearing one of my memories now.

Not at all

☐☐☐☐☐☐☐☐☐☐☐☐

Very much so
- 57

I am smelling one of my memories now.

Not at all

☐☐☐☐☐☐☐☐☐☐☐☐

Very much so
- 58

I am tasting one of my memories now.

Not at all

☐☐☐☐☐☐☐☐☐☐☐☐

Very much so

Thank you for completing the above section. Please also answer the 5 questions on the next page:



- a) Did you find some of these statements upsetting? (Yes / No)  
.....
- b) Please list the names of your regular medications, if possible, or if you do not know the names, write for what purpose you take them.  
.....  
.....
- c) Have you ever sustained any brain damage? (Yes / No)  
.....  
If yes,            i)       how did it happen?  
                                        .....  
                         ii)       when did it happen?  
                                        (e.g., 2 years ago, 1982, or "when I was 15")  
                                        .....
- d) Have you ever seen a psychiatrist? (Yes / No)  
.....  
If yes,            i)       for what problem was it?  
                                        .....  
                         ii)       how long ago was the first time?  
                                        (e.g., 2 years ago, or 1982, or "when I was 15").  
                                        .....
- e) In the last month, have you used any (✓ for yes, ✗ for no)
- |  |                 |        |
|--|-----------------|--------|
|  | alcohol         | .....  |
|  | cannabis        | .....  |
|  | amphetamines    | .....  |
|  | heroin          | .....  |
|  | cocaine         | .....  |
|  | LSD             | .....  |
|  | benzodiazepines | .....  |
|  | other drugs     | .....  |
|  | (which?         | .....) |

✱

**Thank you for your participation.**



## *Appendix 2*

### *Information sheet and consent form: psychometric validation*

.



## **Information sheet and consent form for study of dissociative experiences**

You are invited to participate voluntarily in a research study that will focus on certain experiences that you may or may not have, called "dissociative" experiences. Dissociative experiences include things like normal daydreaming, and not paying much attention to where you are going, as well as symptoms such as memory loss, uncertainty about your identity, feeling unreal, and many more. The aim of the project is to develop a valid and reliable measurement of dissociative experiences at the time that they occur. The potential general benefit of such a measurement includes more accurate diagnosis of dissociative disorders, and people who suffer from these disorders will get the right kind of help sooner.

It would be appreciated if you could complete the 5 short questionnaires given to you by the research assistant and participate in a short structured interview. The instructions with each questionnaire will tell you, for example, whether you should circle a number, or tick a box, or give short answers. While the first questionnaire contains questions about dissociative experiences, the other three contain questions about related emotional experiences. Your entire participation will last about 30 minutes. Please ask if you do not understand or would like more information.

Your answers are confidential. The only place your name will appear is at the bottom of this consent form, indicating voluntary consent to participate in this study. Instead of your name, a number will be assigned to the questionnaire. The number will be used to process the data, thus assuring that you will not be identified to anyone other than the research assistants. The questionnaire information will be seen by Dr. C Krüger, St. Michael's Hospital, St. Michael's Road, Warwick, CV34 5QW, Tel. (01926) 406789, and two research assistants, and you may enquire there regarding the research. All personal information will be treated as strictly confidential and will not be made publicly available. This study has been approved by the local Research Ethics Committee.

By signing to participate in this research, I understand that I am doing so voluntarily, and that my confidentiality is assured. The nature and consequences of this research study have been explained to me and understood by me. I am not under the influence of alcohol or other drugs. It is understood that I may withdraw the consent and discontinue participation at any time. I understand that my legal rights are not affected by agreeing to take part in this study.

Date: \_\_\_\_\_  
Client: \_\_\_\_\_  
Research assistant: \_\_\_\_\_



## *Appendix 3*

### *SSD after psychometric validation*



## SSD

**This questionnaire contains phrases about experiences that you may or may not have right now. For each statement, please tick the box corresponding to the intensity of your experience, as shown in this example:**

Not at all ☐☐☐☐☐☒☐☐☐☐ Very much so

**Read the statement in this column**

**Then answer in this column**

- [illegible]



- [illegible]



- 41

I am having difficulty taking in new information.

Not at all ☐☐☐☐☐☐☐☐☐☐ Very much so
- 42

I am forgetting what I want to do or say.

Not at all ☐☐☐☐☐☐☐☐☐☐ Very much so
- 43

I do not remember much of what has happened so far today.

Not at all ☐☐☐☐☐☐☐☐☐☐ Very much so
- 44

I think I may have forgotten to tick one or more of the preceding statements.

Not at all ☐☐☐☐☐☐☐☐☐☐ Very much so
- 45

I am feeling quite uncertain of where we are in time.

Not at all ☐☐☐☐☐☐☐☐☐☐ Very much so
- 46

I am feeling uncertain of how I arrived at this place today.

Not at all ☐☐☐☐☐☐☐☐☐☐ Very much so
- 47

This situation feels as if it has happened before in exactly the same way.

Not at all ☐☐☐☐☐☐☐☐☐☐ Very much so
- 48

I am having a strange feeling as if I know what will happen next.

Not at all ☐☐☐☐☐☐☐☐☐☐ Very much so
- 49

I am remembering things that I have not thought about for some time.

Not at all ☐☐☐☐☐☐☐☐☐☐ Very much so
- 50

Unwanted memories are entering my mind.

Not at all ☐☐☐☐☐☐☐☐☐☐ Very much so
- 51

I am seeing a past event in my mind's eye right now.

Not at all ☐☐☐☐☐☐☐☐☐☐ Very much so
- 52

I am experiencing a flashback now.

Not at all ☐☐☐☐☐☐☐☐☐☐ Very much so
- 53

It feels as if some past event is occurring again now.

Not at all ☐☐☐☐☐☐☐☐☐☐ Very much so
- 54

I am hearing one of my memories now.

Not at all ☐☐☐☐☐☐☐☐☐☐ Very much so
- 55

I am experiencing a smell now that reminds me of something in my past.

Not at all ☐☐☐☐☐☐☐☐☐☐ Very much so
- 56

Right now there is a taste in my mouth that reminds me of something in my past.

Not at all ☐☐☐☐☐☐☐☐☐☐ Very much so



Thank you for your participation.



## *Appendix 4*

### *Information sheet and consent form: EEG correlates*



## **Information sheet and consent form for study of dissociative experiences**

You are invited to participate voluntarily in a research study at the Institute of Psychiatry, De Crespigny Park, Denmark Hill, London, that will focus on certain experiences that you may or may not have, called “dissociative” experiences. Dissociative experiences include things like normal daydreaming, and not paying much attention to where you are going, as well as symptoms such as memory loss, uncertainty about your identity, feeling unreal, and many more. The aim of the project is to study the relationship between dissociative experiences and EEG brain waves. The potential general benefit of such study includes more accurate diagnosis of dissociative disorders, and people who suffer from these disorders will get the right kind of help sooner.

The procedure will include short self-report questionnaires alternating with EEG measurement, and you will be guided throughout. Your entire participation will last about an hour. Your travel expenses will be reimbursed. Please ask if you do not understand or would like more information.

Your answers and EEG are confidential. The only place your name will appear is at the bottom of this consent form, indicating voluntary consent to participate in this study. Instead of your name, a number will be assigned to the questionnaires. The number will be used to process the data, thus assuring that you will not be identified to anyone other than the research assistants. The information will be seen by Dr C. Krüger, St. Michael’s Hospital, St. Michael’s Road, Warwick, CV34 5QW, Tel. (01926) 406789, and three research assistants, and you may enquire there regarding the research. All personal information will be treated as strictly confidential and will not be made publicly available. This study has been approved by the Maudsley Hospital Research Ethics Committee.

By signing to participate in this research, I understand that I am doing so voluntarily, and that my confidentiality is assured. The nature and consequences of this research study have been explained to me and understood by me. It is understood that I may withdraw the consent and discontinue participation at any time. I understand that my legal rights are not affected by agreeing to take part in this study.

Date: \_\_\_\_\_  
Client: \_\_\_\_\_  
Research assistant: \_\_\_\_\_



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